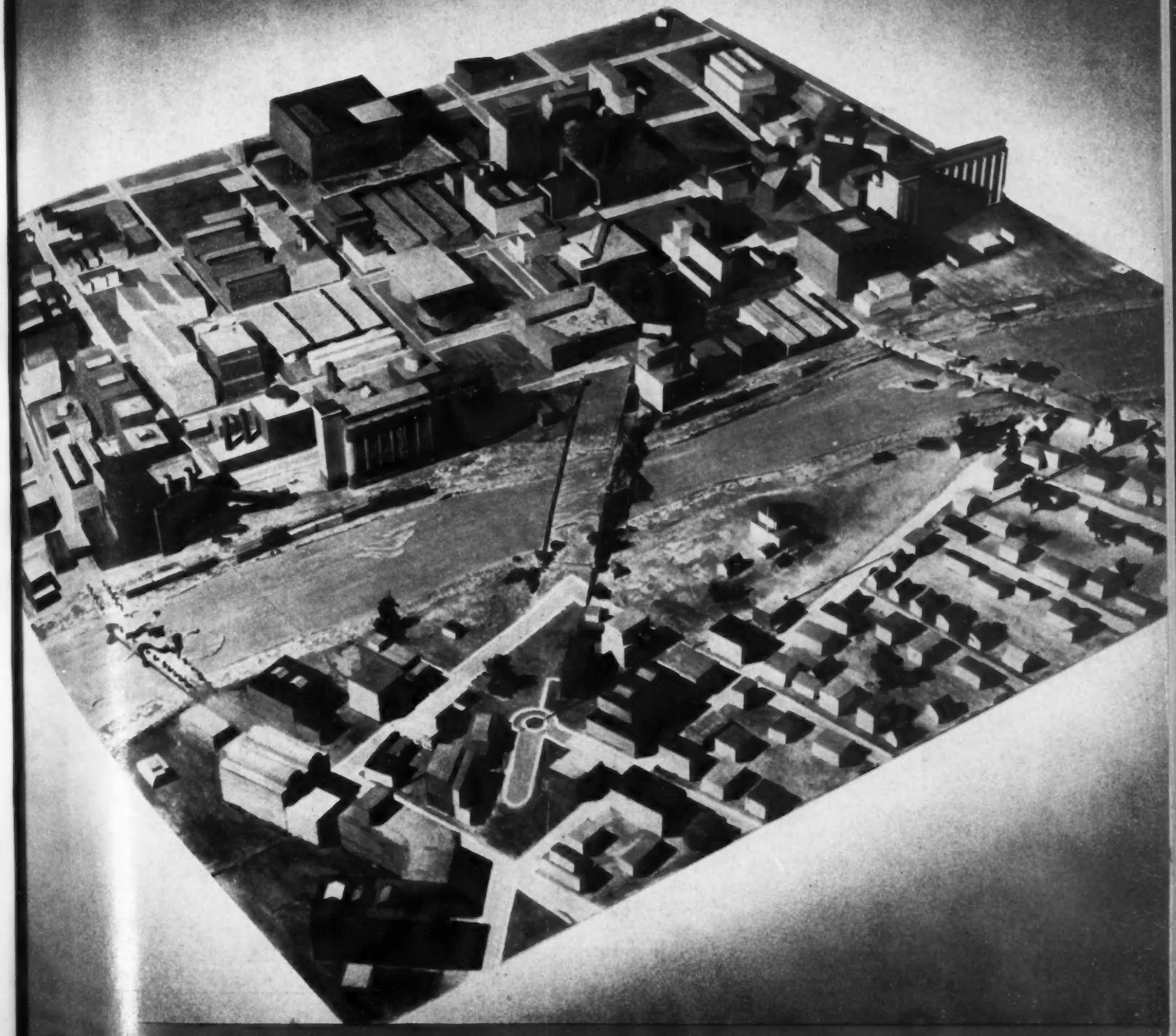
Electrical World

SEPTEMBER 5, 1942



PROTECTIVE CONCEALMENT OF UTILITY PROPERTIES

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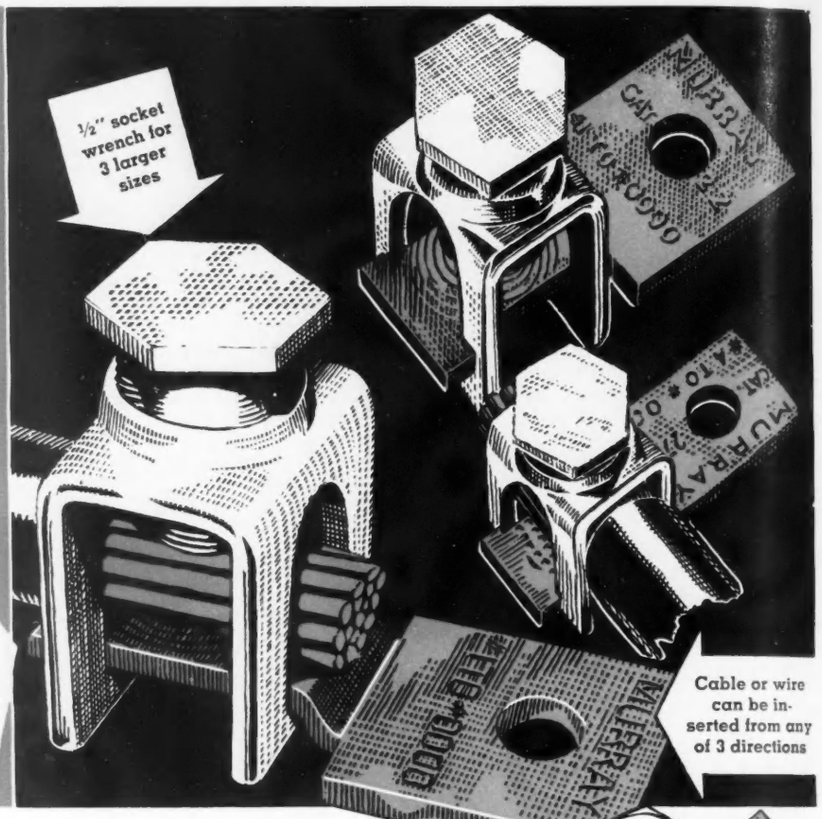
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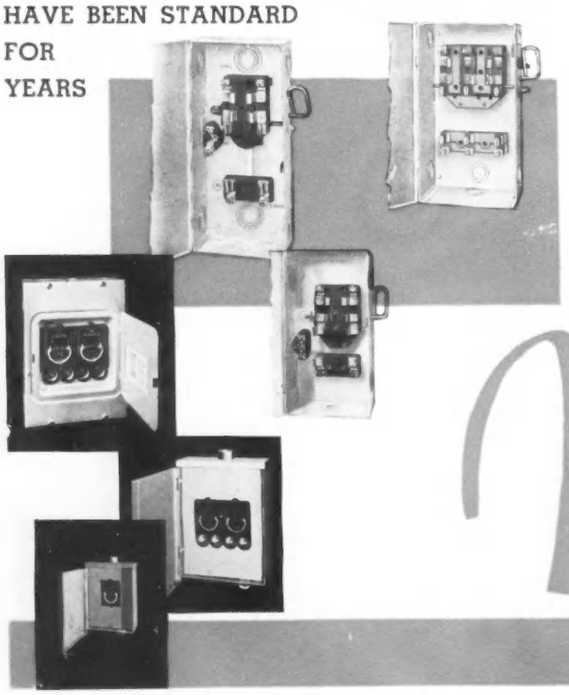

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September 5, 1942

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McGRAW-HILL PUBLISHING COMPANY, INC.
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Electrical World—Published weekly. Price 25 cents a copy. Allow at least ten days for change of address. Address communications about subscriptions to Director of Circulation, Electrical World, 330 West 42nd Street, New York, N. Y. Subscription rates: In the United States, Mexico, Central and South American countries, $5 a year, $8 for two years, $10 for three years. Canada, $5.50 for one year, $9 for two years, $11 for three years (Canadian money at par). Great Britain and British possessions, 54 shillings for one year, 108 shillings for three years. All other countries $9 for one year, $18 for three years. Entered as second-class matter November 16, 1936, at Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Contents copyrighted, 1942, by McGraw-Hill Publishing Company, Inc. Branch Offices: 520 North Michigan Avenue, Chicago; 68 Post Street, San Francisco; Aldwych House, Aldwych, London, W. C. 2; Washington, Philadelphia, Cleveland, Detroit, St. Louis, Boston, Atlanta, Ga.

Publication Office
99-129 North Broadway, Albany, N. Y.

Editorial and Executive Offices
330 West 42nd Street, New York, N. Y.

JAMES H. McGRAW, Jr.....President
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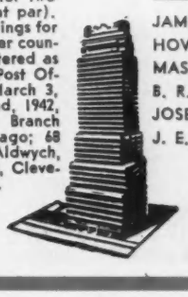
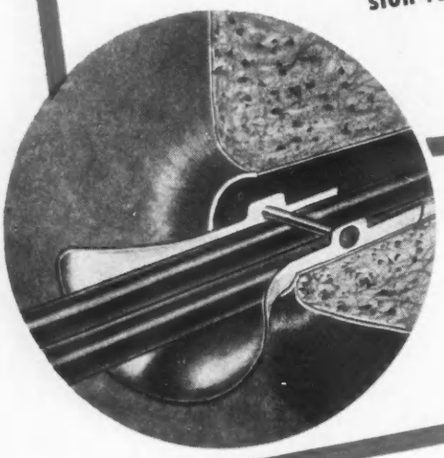


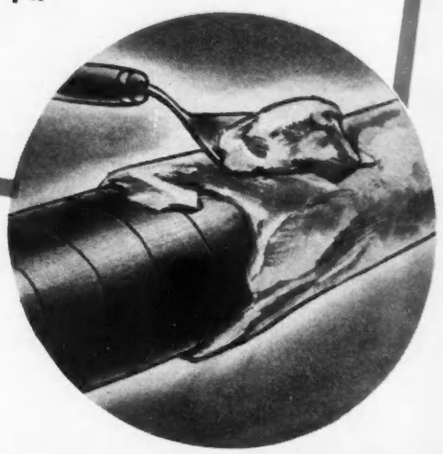
A McGRAW-HILL PUBLICATION

3 Simple Ways to Protect Cables for LONGER LIFE

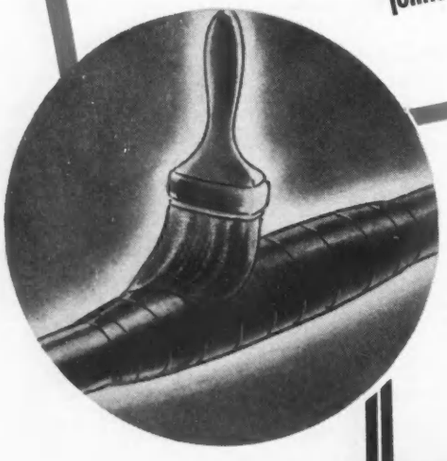
1 Where wear may occur, such as in duct mouths, protect your cables with a semi-circular abrasion-resistant sleeve.



2 Protect the joints of cables in manholes from fire by proper fireproofing.



3 Splices properly made and insulated will last longer when protected by a coating of weather-proof paint. Repaint old joints now.



Protect your cables, because they are difficult to replace at this time. A preliminary inspection will show many simple and easy ways to guard against possible injury. In addition to the three suggestions on this page, Okonite has included many more in a new folder—"Do's, Don'ts and How's For Longer Life with Your Insulated Wires and Cables." Send for a copy now! If you have any suggestions that you are willing to share with others, won't you send them to us?

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More Emphasis on Safety

Responsibility for prevention of accidents weighs heavier today on electric utility management than it did yesterday. Tomorrow the weight will be still heavier.

Strength to carry load and to resist shock, characteristic of utility system design and construction, was built into those systems by men who knew the capabilities for violence inherent in the element they handled. That they built well is attested by the record of the years.

One reason for ample factors of safety in structures and equipments, for provisions of generous reserves and for inclusion of back-up alternates was insurance of continuity and quality of service. Criticism of the cost of this insurance has not been lacking, both from men who frankly admitted the clearer vision of hindsight in themselves and their fellows and from others who only sought something to criticise. But there was another reason for the strength and protective provisions built into utility systems. This was safety of person and property.

Continuity and quality of service can be pared down considerably in these exigent war days and customers will cheerfully put up with inconveniences caused thereby. The reason why the electric range does not heat as fast as it did, why the lights flicker once in a while or why service is not restored so quickly after a storm can readily be explained in terms of war necessity. The Power Branch of the War Production Board has stated flatly that "gold-plated" electric service is out for the duration. In its recent orders curtailing capacity expansion the board states that peacetime standards of service reliability cannot be maintained and that "civilian inconvenience and sacrifice must be expected."

What is happening is that the reserves of all kinds originally built into electricity supply systems as service insurance are now being used for higher loads and greater outputs. Ability of systems to carry loads has been up-rated, facilities are being worked longer hours, margins of safety of service are being reduced.

This reduction can and will be accepted as a wartime necessity, but parallel reduction in the margins of safety to person, or to property either, can be avoided and therefore need not be tolerated. The principal means for their avoidance are increased insistence on safe working practices, on closer supervision of work from the safety angle, or more intensive inspection to discover actual and potential hazards and on greater emphasis laid on safety education of employees and public.

War services of all kinds are making heavy demands on electric utility personnel. Men thoroughly trained in safe handling of their jobs are being replaced by others to whom the aspects of danger are less clearly apparent. Heavier loads and longer hours of operation increase the chances of trouble in machines and other equipment. Failures and breakdowns will inevitably become more frequent. These conditions will be worse before they are better.

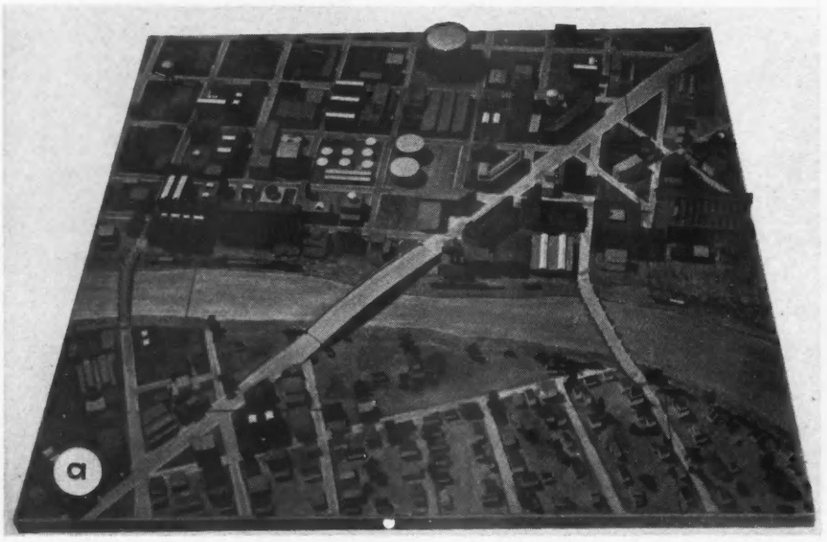
Thus it is that the responsibility of utility managements for accident prevention is heavier today than yesterday and will be heavier tomorrow. This is why power companies should join in the great wartime campaign of accident prevention now being launched by the National Safety Council and which is being financed by the War Production Fund to Conserve Manpower.

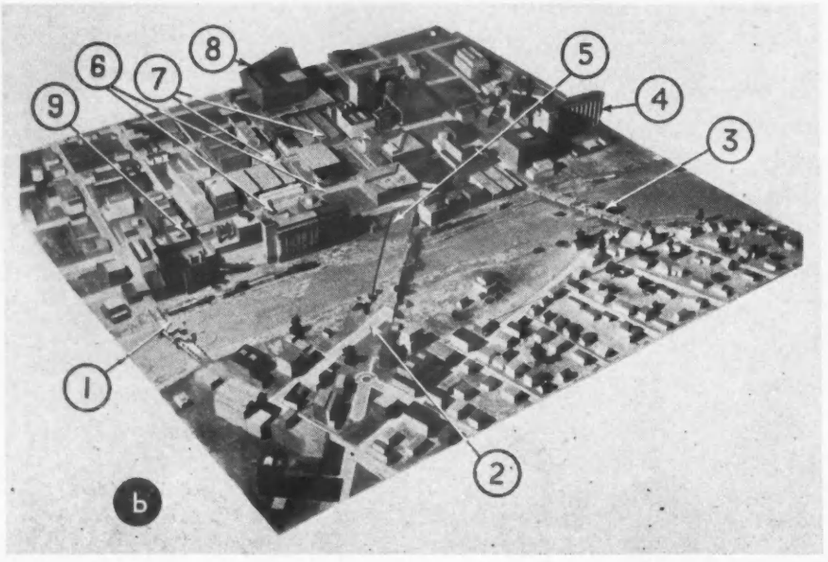
Protective Concealment Of Utility Properties

The day of zebra-stripe camouflage is gone — Modern camouflage of utility targets is a matter of community cooperation demanding concealment of orientation points as well as prime targets — Handbook camouflage is fatal — It must be guided by experts

KEITH MARTIN, Director Kansas City Art Institute, Kansas City, Mo.

THROUGH modern camouflage, the concealment of utility plants and structures can be rendered deceptive by giving plant buildings, for example, the appearance of river-bank shacks surrounding broken-down and unused factory and warehouse buildings. Where possible, the construction of dummy structures at a safe distance will distract the attention of bombardiers. Highways, ponds, reservoirs or other telltale landmarks that point to a vital target can be obliterated by overhead nets or the continuation of vegetation can be used and supported by planks, logs or barges floating on the surface. Chemical feeding methods can be used to speed growth of concealing vegetation. Where running water is the give-away, as in the case of a river, false fog, smoke-screens and various direct methods of changing the distinguishing features of the shore line must be employed. Artificial structures or patterns, applied to the vital plant itself, must match the surround-





HYPOTHETICAL industrial area before and after camouflage

(a) Before concealment, prominent diagonal highway, three bridges, gas holder and grain elevator provide reference points for locating power station at lower left. (b) After camouflage partial concealment leads to confusion of enemy bombardiers; some buildings have been left unconcealed in model to show glaring contrast: (1) Sandbar superstructures. (2) Buildings on diagonal, grouped as park. (3) Flotation sandbars to disrupt bridge shadow. (4) Grain elevator left untouched. (5) Shadow by bridge rail. (6) Two kinds of treatment on grain elevator and attempt to break into two separate buildings with strong contrasting color. (7) Covered oil storage tanks. (8) Superstructure over gas holder. (9) Generating station broken into two buildings, some stacks concealed.

Diagonal highway netted; covered and squared off streets. Painted rope fringing so cars may pass under, etc.

ings, not only in pattern but color, texture and in some instances chemical content.

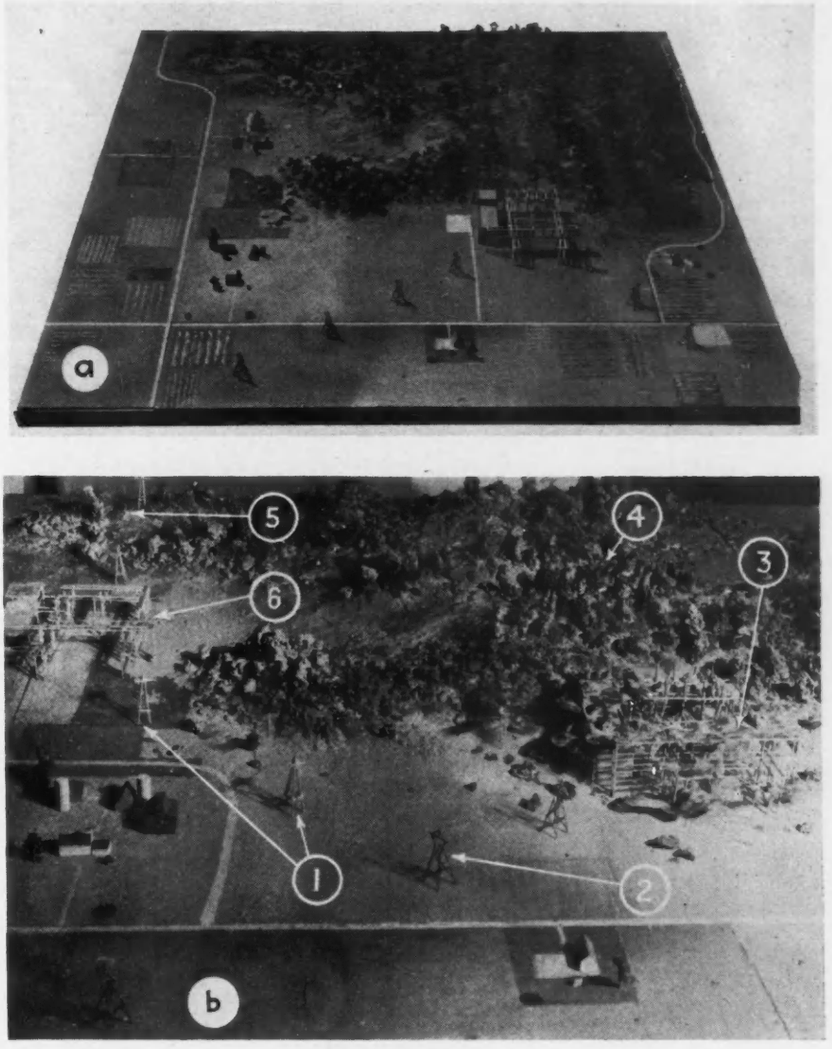
In modern warfare concealment of utility system components alone does not constitute effective camouflage protection. Modern camouflage is a community matter, calling for deceptive concealment of not only the prime targets but of all orientation points or axis from which enemy bombardiers can determine the location of vital utility system objectives. This calls for the disguising of arterial highways, bridges, rivers, railroad lines, prominent stand pipes and gas holders and the like in the neighborhood.

For these and other reasons utility employees, using the best manuals in the world, cannot be expected to do an effective job of camouflage without the supervision of personnel trained in the various aspects of camouflage. In his approach to the problem, a good camouflage supervisor must combine the skills of the engineer, the artist, the chemist, physicist, aerial photographer and the tactical approach of the bombardier, as well as other phases of scientific, artistic and psychological knowledge.

Production Protection

While costly, camouflage is not expensive when considered in relation to the protection it offers. Cities, transportation, production in a wide area can be stopped dead by the destruction of one or two power stations. Hundreds of millions of dollars' worth of active war effort can be arrested by the bombing of a relatively few strategic power producers. This point is heavily emphasized in order to make clear that in war we deal with absolute and in many cases irreplaceable industrial power, and all the insurance policies in the world and government reparations will not wave a magic wand and replace overnight 50,000-kw. generators damaged or ruined by bombs.

Bombs dropped from any altitude from 5,000 to 30,000 ft. can be placed quite accurately with the use of almost any modern bomb sight, *provided that the specific target is clearly visible to the bombardier*. But the bombardier does not have five minutes to detect deception. Time at his disposal is short, in the order of 35 to 45 seconds, or at most a few minutes, depending on altitude and speed.



SWITCHING station before and after camouflage

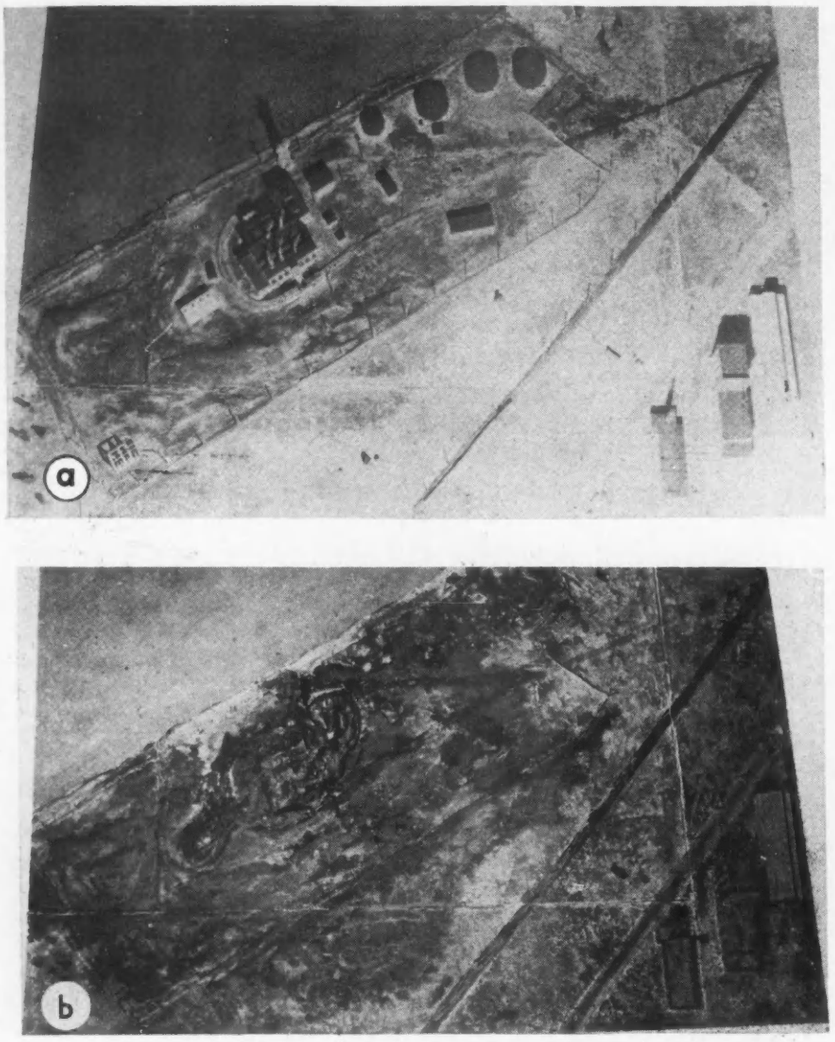
In "after" picture (b) of model note:
(1) Dummy towers of 2 x 4-in. construction. (2) Real towers, first two would be done away with, others faded into ground color with paint. (3) Real station with broken terrain camouflaged on supporting wire nets. (4) Real power slash planted over with low scrub. (5) Obvious fake power slash. (6) Dummy station of wood for target (actually would be further away, ½ to 1 mile).

If, therefore, the pilot and the bombardier are confused, if they cannot see clearly their specific targets on the cross wires of the bomb sight, the chance that their bombs can be dropped on the target are very, very slim, in the opinion of men from our own armed forces who have had experience in bombing. These men agree that if a target is clearly visible to them they can do a pretty neat job of destruction.

Deceptive Concealment

Camouflage, therefore, that is based on confusion of identity is as useful and effective as total concealment. There are varying degrees with which camouflage may be employed. Coloring the buildings with an unobtrusive color in itself is valid. Use of special paint patterns on buildings to break up their apparent identity into a simulation of harmless surroundings is even more effective. In screening a boulevard the roof or park pattern must be carried over the street. This can be done with nets, wooden platforms, trees on poles and other methods. When false sides are needed to simulate buildings, and yet permit traffic movement, curtains of old rope or nets, colored to match typical buildings and supported on rollers, can be used.

A total job, including the use of horticulture, superstructure, shadow-



HYPOTHETICAL power installation in isolated river area before (a) and after concealment (b). Dummy plant would have been set up elsewhere on the river

breaking projections, nets, paint, natural soil, dirt, smoke concealment and other details combating the use of filtered and infra-red photography, as well as visual observation, naturally is most effective and can approach almost total concealment of objectives.

In many areas where there are particularly difficult problems normal industrial smoke can be increased temporarily through maladjustment of fuel mixtures. Studies are under way to ascertain certain types of materials which can be burned in residential fire boxes and in special smudge pots in order to carry a smoke screen out beyond the edges of the vital area, especially on the windward side.

Rights-of-Way

Where switching stations are located in foothills, particularly at the end of power slashes cut through wooded country, attention must be paid to the reduction of visibility of the actual power slash through low growth planting and by cutting of a fake slash reasonably near by, but not too close, leading to a prominent dummy switching station. Meanwhile, of course, the use of low visibility paint, confusion of pattern, shadow-breaking construction, horticulture and all other means must be applied to reduce the visibility and identity of the real station. Fake roads, made by scattering ashes on disturbed earth; fake farmhouses and "mobile trees" can be used to falsify reference points in open country.

Camouflage an Art

Camouflage must be planned and executed before the first enemy planes appear. The general plans must be kept secret. It is as much an active military protection as several batteries of anti-aircraft guns and a squadron of pursuit planes. None of us know the equipment, capabilities or intentions of the enemy, other than if possible he will destroy us. This is no time to take chances on opinion which declares that the enemy cannot do this and cannot do that. That policy has been very costly to us, and brought defeat to France. We are at war now, and well under way, so let us not take any more unnecessary chances by leaving so much of our essential war production plant clearly visible from the sky.

•

Committee Approves Repair Shop Jobs

WHILE the North Birmingham shops of Alabama Power Company occasionally undertake rebuilding jobs of large transformers, their main purpose is the repair of the many smaller items of equipment which fail or become obsolete in service and the fabrication or construction of construction items in case of long deliveries, excessive prices or difficulty in finding suppliers.

In the highly industrialized portions of the country it would not be necessary to go to such extremes in the way of shop facilities, but with the nearest major factory or repair facilities some hundreds of miles away a well-rounded repair shop becomes a real asset.

In the construction of transformers, breakers, switch cabinets and other equipment, there is no reduction in standards as compared with comparable items purchased—the same standards and specifications being adhered to.

An interesting feature in connection with the operation of the shop is the engineering committee, which passes on shop designs and redesigns and approves plans and cost estimates in the case of larger jobs before any work is started. This same committee passes on the completed equipment before it is accepted for installation.

Another interesting feature is the shop accounting system, which automatically provides for absorption of all items of cost—direct, indirect and overhead—so that the company does not delude itself as to shop costs.

Better Draft Layouts Improve Operation*

Opportunities for streamlining boiler plant duct interiors offer an attractive and speedy means of correcting gas and air flows which impair economy

JOHN CASSIE,† B. F. Sturtevant Company, Hyde Park, Mass.

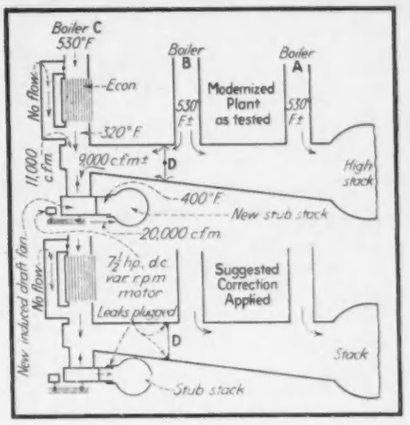


FIG. 1—Motor overload corrected by eliminating air leaks

SERIOUS overload on a motor driving an induced-draft fan in a boiler plant occurred when the installation was equipped with a fan and new stub stack in addition to the former exclusively natural draft facilities. There are three boilers in the plant, A, B, and C. In modernizing the installation (Fig. 1) boiler C was equipped with an economizer and induced draft. The plan was to operate boiler C on base loads after adding the mechanical draft equipment.

The fan motor was rated at 7.5 hp. and is a d.c. variable-speed machine. At 390 r.p.m., with 11,000 c.f.m. of gas coming from the economizer and about 9,000 c.f.m. from the main stack duct, the brake hp. was 8.3. When speeded up to 505 r.p.m. the fan handled 26,000 c.f.m., but the motor output rose to 18 hp. Thermometer readings indicated that the temperature of gas dropped in the economizer from 530 deg. F. to approximately 320 deg. F. If the installation had operated as intended, the temperature should have been a little under 320 deg. F. due to radiation, but it ran sufficiently above to indicate leakage from a higher temperature source. The temperature of the gas in the fan was found to be 400 deg. F. Leakage, therefore, existed due to the differential between boilers A and B across the sectionalizing damper D. This leakage increased with a rise in fan speed and the 230 percent load on the motor occurred during an attempt to establish proper furnace draft.

With the design of fan used, the "H.P.-Volume" characteristic is almost wholly independent of pressure alterations due to disadvantageous duct connections. The motor input measurement gave an indirect indication of the gas volume handled by the fan. By heat balance to and from the fan it was established that 44 percent of the gas handled by the fan was leakage, presumably from boiler B. By effectively sealing damper D (at nominal cost) all three boilers can be operated as intended; the fan efficiency has been increased by elimination of the eddy currents set up by the impingement of the leakage stream against the gas stream from boiler C, and it was unnecessary to purchase a larger motor for the fan drive.

In the second case, an Eastern power company's steam plant had an induced draft installation which gave trouble from conditions which overloaded the fan motor to 170 percent of its rating. The condition was remedied by the installation of about 100 sq.ft. of ⅛-in. steel plate guide vanes in the duct system, as illustrated (Fig. 2). In such work the expected head, horsepower and efficiency curves maintain only if the fan is connected to standard duct layouts as prescribed in Marks' Mechanical Engineering Handbook, Edition 3, pp. 1902, 1917-8, and as discussed in *Trans. A.S.M.E.*, Vol. 55, No. 11. Inlet connections are most important.

In the above plant a right-angled turn was included between the air heater exit and the fan inlet box entrance. The ductwork also was handicapped by a too sudden change in stream width (plan view) in transition from the wide air heater to the relatively narrow inlet boxes. End contractions are caused, thus utilizing only a fraction of the available box width. In another case correction of this effect alone increased the fan efficiency over 50 percent, thus reducing the horsepower required for a given volume of gas handled.

The guide sheets, made up by a local metal working concern, were installed in approximately one day. Because of an adjacent I-beam, it was not feasible to provide a streamlined corner below the air heater discharge into the duct before making the 90-deg. direction change in the gas flow, but the guide vanes placed elsewhere met the situation.

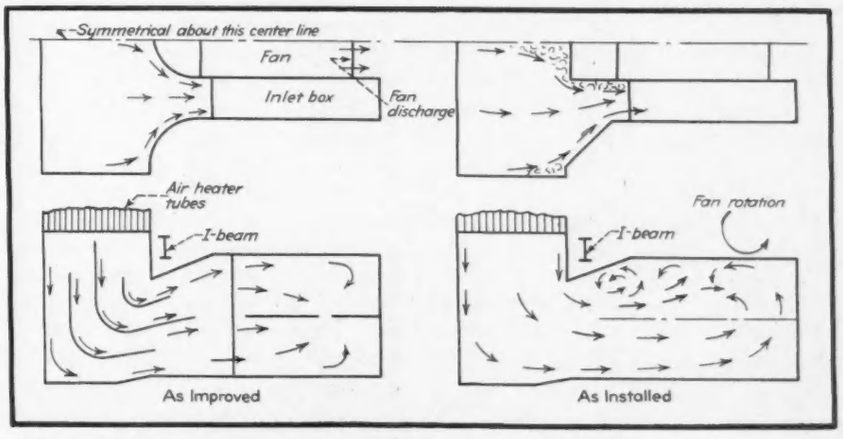


FIG. 2—Guide vanes streamline part of duct system and reduce losses

*Examples of improvements in induced draft arrangements, supplementing article "More Capacity with Little Additional Equipment," "Electrical World," April 4, 1942.

†Installation Analysis Department.

PRIORITIES PROBLEMS

THE priorities machinery that has been made available for the users of power generating, distribution and utilization equipment is, necessarily, complicated and ever-changing, so that they must know what to ask for, what can be obtained and how to ask for it in their applications, if they are to get prompt and adequate consideration of their requirements.

With this in mind, ELECTRICAL WORLD initiates with this issue a regular priorities service designed to help utility and industral operators understand the rules and regulations governing the priorities machinery available to them, and the reasons why, oftentimes, it is necessary to do things "the hard way" instead of the ways to which they were accustomed in peacetime, and to which they can return the sooner by getting on the with present job now.

This priorities service will, in so far as is possible, be in case study form, with the thought that actual examples offer the best understanding of inert regulations. In so far as possible the questions from readers will be answered by the citation of other cases embodying the principles involved. While the case analyses do not carry official indorsement, the material has been and will be prepared with the full cooperation of the power division of the War Production Board.—EDITORS.

Bare Bones Construction

Case No. 1

Policy for wartime construction is that it must be of the simplest design, using the minimum amount of critical material necessary to do the job.

In terms of utility extensions, this means that normal standards of construction calling for the usual extra performance margin in conductor, transformers and structural strength and permanence are out for the duration. To get a prompt and favorable determination on such extension applications, only the "bare bones" amounts of critical materials can be applied for. Witness a recent instance in which six weeks was consumed in negotiations to write down the specifications, after which it took less than two days to get an A-1-b rating. The extension, incidentally, was completed in time only because the war plant itself was delayed several weeks beyond the original completion date.

Involved was an extension of a 154-kv. line and substation to serve a new smelter in the Middle West, and costing around $100,000.

The smelter project carried split ratings—A-1-a, A-1-j and A-3. The utility application was filed under Section E-2 of Priorities Order P-46, which permits a letter application to the power division for extensions to serve war projects rated A-5 or higher. Under Section B-1 (iii) of the same order, the power division can automatically apply the lowest rating held by the war project to any such extension. In this case a much higher rating was necessary and the A-1-b was obtained upon the representation of the power division that the project was essential and called for a minimum of material.

Originally, the utility asked for steel towers, a bank of four transformers (one a spare), 350,000-cir. mil conductor, a steel substation structure, oil circuit breakers on the 33-kv. side, metering on the high-tension side of the line.

Much of this equipment is next to impossible to obtain. Structural steel, for instance, is among the most critical. The power division has announced a policy against any spare transformers and requires, wherever possible, use of one three-phase unit in place of three single-phase units. Size 350,000-cir.mil cable must be drawn to order, in competition with the manufacture of degaussing cable for ships, which means it can't be had if anything else will do; in this instance inquiry developed that a neighboring utility had sufficient No. 3/0 wire in its excess stocks. Metering on the high side of the line is standard practice, but it takes several times as much critical material as metering on the low side, and rates can be adjusted more simply than copper can be secured.

Because of all this, the power division rejected the first application and directed simplification of the specifications to meet WPB's construction policy. After long-distance phone calls, Washington conferences and additional correspondence, a second application was filed. It called for wood poles and substation structure, one three-phase transformer, No. 3/0 conductor, fuses in place of the circuit breakers and metering on the 33-kv. side.

The A-1-b priority rating then was granted promptly. The changed specifications eliminated 20 tons of structural steel, reduced the amount of copper in the project by 15 tons. Actually, the amount of new copper "saved" from fabrication amounted to 50 tons, because the 35 tons of No. 3/0 wire was already in stock.

Necessity Mothers Improvisation, Too!

Case No. 2

This is the story of how a 100-kv. transformer which was in the utility's storeroom helped to do a 500-kv. transformer job.

To increase the capacity of an industrial feeder, a 500-kv. transformer was needed in place of the existing 300-kv. unit. Having none of the larger size in stock and being unable to find one in neighboring company inventories, the utility applied on a PD-1A form for a rating to purchase a new unit.

WPB's power division takes a lot of convincing these days before it issues a certificate for a new transformer, particularly a big one. In this case the application was returned with the suggestion that further study be given the problem in an effort to find some other solution.

The utility's engineers went to work on the problem again. They found another feeder with a 500-kv. transformer where, because of shifting loads, a 300-kv. transformer, perhaps carrying overloads part of the time, would now suffice. They found a way to shift another 300-kv. transformer already in service to this spot —and so on down the line until the vacancy that existed needed only a 100-kv. transformer, which was in stock.

Back came the utility's application —this time simply a letter to the P-46 section of the power division asking authority to withdraw the smaller unit from excess stocks—permission for which was promptly granted.

War Housing Formula

Case No. 3

In a busy industrial area gorged with war work, a large emergency housing development stood vacant for several weeks this summer already built—but without utility service connections because of WPB procedures which failed to mesh.

The housing project had been given priorities for construction and inside wiring materials under Order P-55. The utility, later, filed a series of PD-1A forms because the extension job wasn't big enough to warrant a PD-200 project application. In Washington the utility's PD-1A's got separated and the applications for line hardware and distribution were sent back rejected. The application for copper wire was returned with the advice to redesign for steel wire. The request for authority to withdraw meters from stock was granted. But meters, without distribution, couldn't light the homes that war workers were waiting to move into.

What should the utility have done? Until recently the PD-1A or PD-200 route was the only course of action open if priority ratings were needed. Because of situations just like this one, however, the WPB power division has had available since June 23 a streamlined method of insuring that utility applications for war housing extensions get consideration by the same officials who OK the housing project itself, provided that the utility service meets certain standards. So, the utility in this instance was able to refile its application under the June 23 procedure and get approval for the job in a single rating. Being a privately financed project, this was done by filing with the local FHA office for routing to WPB field office, using the PD-545 form.

In this instance the houses were already built and waiting for utility service. The same procedure is open for any type of war housing project. It's the utility's responsibility to satisfy itself that its service connections fall within the power division's standards (ELECTRICAL WORLD, June 27, 1942, page 62). If they do, the utility fills out the PD-545 form which is given to the building contractor for filing with the local FWA or WPB office at the same time he files application for construction. Applications for connecting publicly-financed housing are filed with the Federal Public Housing Authority for submission, again right along with the construction plans, to the WPB Bureau of Construction in New York.

Either way, the utility applications are handled and rated by the same people who rate the construction project. No more ill feeling because the utility "won't" provide service!

Product vs. Construction Ratings

Case No. 4

Utilities frequently confuse the scope of availability of the rating made available to them in Section B-1 (iii) of P-46. Here's a typical example:

A Western utility asked for the A-1-b rating held by a laboratory, proposing to do an important job for the Navy, so that the power company could obtain materials for connecting additional electric service at the plant.

The application properly followed the procedure laid down in Section E-2 of P-46 for the rating extended in Section B-1 (iii), and there is no question, in this instance, of the essentiality of the extension. But the B-1 (iii) rating is not applicable.

The rating extended by that provision of the order is available only where the war plant's rating is for construction of new facilities or expansion of present capacity; if a new war plant is being erected or obtaining new equipment on an A-1-c rating (any rating of A-5 or higher) the utility is eligible for the same rating for materials with which to make the service connection. The laboratory's rating, in this case, however, is one assigned by Naval ordnance to the laboratory for obtaining the raw materials for its own production. In other words, the laboratory holds a product rating, not a construction rating.

Correct procedure, in instances where additional electric service is required for an existing plant, is to apply to the power division by letter, requesting permission under P-46 to withdraw the materials from inventory, not to be replaced, if the necessary materials are in stock. If they aren't, application should be made on a PD-1A form for a rating with which to obtain them. In the instance cited here, the power division simply short-circuited the red tape and authorized the utility to withdraw the materials from its own excess stocks and not replace them.

Normally, if the work involved considerable material, the application would have to be rejected with instructions that it be refiled in the proper manner.

℞ Don't file a PD-200 or series of PD-1A's to get permission to connect a privately financed housing job where the construction has been approved as an exception to Order L-41—the order which halted all unauthorized construction. These are cases where the builder has been given permission to build a house for which he has all the materials on hand; it therefore has no rating and the utility extension doesn't match the required procedure for rated housing projects (see Case No. 3).

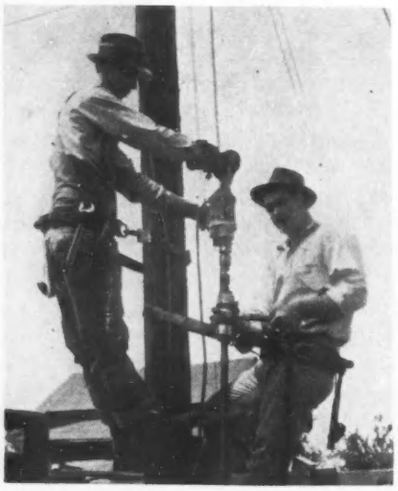
Notwithstanding the lack of rating for such houses, utilities should fill out the regular PD-545 form for housing extensions, after making sure that the design qualifies under the utility standards required by the WPB power division. The PD-545 should be given to the contractor with the request that he submit it to the FHA office for routing to the power division as an appeal. A letter explaining that the extension does not qualify for the rating under section B-1 (iii) of the utilities order P-46 because the housing job has no rating is a good thing to attach to the PD-545.

All the limitations covering home extensions and use of materials apply in these instances. Only the procedure for getting approval varies.

Rapid Installation of Effective Deep Grounds

Well-drilling technique adapted to reaching water table at 25 ft. — Four-man crew places 20 to 25 ground rods daily — Operating results from this deep grounding are yet to be determined

LLOYD N. REBSAMEN. City Water and Light Plant, Jonesboro, Ark.*



NO. 1—Linemen operating electric drill socketed atop well-head through which water is fed into drill stem by hose; linemen work down pole as hole is drilled

DURING the past year our distribution system was batted around considerably by unusually severe lightning storms. A search for the reason revealed many high resistance grounds on the distribution system, which is a 2,500/4,160-volt grounded neutral system. Station grounding makes use of several abandoned well casings and has consistently tested zero. Distribution grounding was by use of ½-in. x 8-ft. copperweld driven rods.

Substantial improvement was desired in the continuity of service during electrical storms, which at times were quite severe and which had during the past year resulted in the loss of line fuses, several transformers, some small customer's equipment and meters, and even some lightning arresters.

After considerable study and investigation, in which several manufacturers and operating electric companies were contacted, we came to the conclusion that deep grounding might be the answer.

Accordingly, we set about the task of developing a method of accomplishing deep grounding that would be fast, economical and, above all, make use of present ground rods and scrap copper wire without the use of new materials.

Down to Moisture Level

Considerable experimenting with test grounds at various depths showed that, with our underground strata, we could depend on grounds to a depth of 25 ft. as being consistently below 5 ohms. At this depth we believe we have materially entered the level of permanent ground moisture.

The next problem was how to place grounds at this level without the use of critical materials. We found that

* Manager and engineer.

NO. 2—Electric drill socketed on top well-head on top drill stem; hose at left bottom feeds water to drill bit

NO. 3—Water and drill cuttings coming out of hole around drill stem

NO. 4—Ground rod with tail-lead attached

NO. 5—Salting the hole before inserting ground rod

NO. 6—Ground rod inserted in hole; follow-up rod about to be socketed on top of ground rod; holding back on tail-lead maintains contact

NO. 7—Follow-up rod being withdrawn after ground rod is pushed below bottom of drilled hole

almost all old ground rods could be reused, since they were of the copper-weld type. The use of scrap copper wire in short lengths spliced together for tail-leads would answer that problem if we could place the ground rod deep enough to enter the level of permanent moisture.

Men in our water department helped develop a drilling method for this job, which is shown in the accompanying illustrations.

Modified Well-Drilling

In the usual well-drilling method used in this part of the country some sort of power hook-up drives or rotates a drill stem. At the top of the drill stem is a well-head which allows mud to be pumped through a flexible hose through the well-head and into the drill-stem. At the bottom of the drill-stem is attached a fishtail bit with an opening on each side of the fishtail for mud to exit into the hole being drilled. Mud serves, in well drilling, the dual purpose of sealing voids in the wall of the hole to prevent caving and to remove the drill cuttings by flushing them to the top of the hole and out.

Since our fishtail bit was only $1\frac{1}{4}$ in. across the widest part and our drill-stem was made from $\frac{3}{4}$-in. extra-heavy pipe we found that mudding the hole was not necessary and that water would serve the purpose of flushing the cuttings from the hole.

Water, with us, was very easily obtained by connections of hose to the most convenient fire hydrant, or to a customer's sill cock, or even to the customer's service line at the curb meter setting.

A drill stem 21 ft. long was conveniently had in one length and was found easy to use on the grounding job.

Four-man Crew

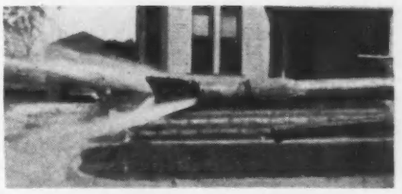
In the drilling process two linemen man the drilling from the top of the drill-stem, assisted by two groundmen who hook up the water and assist in the raising and lowering of the drill-stem, the electric drill and the follow-up rod.

A single line block hung from the pole crossarm provides a means of raising the drill-stem and well-head and a $\frac{5}{8}$-in. (bit size) electric drill attached to the secondary provides the power for the rotation of the drill-stem. Water feeds through a $\frac{3}{4}$-in. hose into the well-head, down through the drill-steam and out through two openings in the fishtail bit. As the bit rotates an occasional slight lift of the drill helps speed drilling by removing any mud balls that might cling to the bit. Cuttings are flushed to the surface by the water.

The linemen are suitably protected by rubber blankets, hoods and line hose, besides their usual rubber gloves, when working close to the overhead lines.

Holes go down the full 21 ft. in an average of five minutes drilling time. When the hole is completed the drill is removed at the ground and the drill-stem is removed by pulling on the rope line.

Ground rods have been prepared by soldering tail-leads about 2 in.



NO. 8—Fishtail bit attached to drill stem laid on truck for moving, showing water jetting from bit

NO. 9—Well-head attached to upper end of drill stem, permitting water to enter drill stem through hose connected and permitting rotation of drill stem without twisting hose

below the top of the rod. The hole drilled for the ground rod is salted.

A 21-ft. long follow-up rod or ramrod is now raised so that the lower end, drilled slightly larger than the ground rod, sockets on top of the ground rod placed in the hole. By holding back on the tail-lead as the follow-up rod is fed down into the hole contact between the ground rod and the follow-up rod is maintained.

The point of the ground rod is now 21 ft. below the ground surface, with

the follow-up rod extending 8 ft. above ground surface. Three men of the crew grasp the follow-up rod high up and ride it down until only about 3 ft. remains above the ground surface. The point of the ground is then 26 ft. underground.

Four-Man Crew

Tail-lead is then attached to the pole ground lead. Readings of before and after ground resistance show reduction from an average of 24.9 ohms to 3.05 ohms for 47 grounds. Certain cases showed the following reductions: 70–6, 60–3, 48–4, 42–2, 38–4, 33–5. Many of the new grounds run as low as 1 or 2 ohms. Only one showed as high as 7.

A four-man crew has consistently drilled holes for and placed between 20 and 25 ground rods daily. Grounds are placed about 2½ ft. from the pole, which is convenient for the linemen operating the top of the drill-stem, since they must come down the pole as drilling progresses.

By pushing the ground below the drilled hole we get as much as 5 or 6 ft. of ground rod in solid earth. We do not attempt to drive the follow-up rod below that point. Tail-leads sometimes shear from the ground rod if driving is attempted.

Speed, Salvage Attained

We believe the big advantage of this method lies in the speed of the work, the fact that old ground rods can be reused and that scrap copper wire can be used for the tail-lead.

Water used is nominal, averaging about 40 gal. per ground. Water on rural lines may be obtained by using a small tank and pump mounted on the tool truck.

We have been so enthused over this method of drilling holes for deep grounding that we are at present developing a design for a completely truck-mounted portable drilling outfit. It will have a power-driven rotary, a winch, a collapsible derrick, a water tank and force pump and all equipment for a complete ground-setting job, eliminating completely the necessity for linemen to operate drilling from poles. With this sort of equipment holes of almost any depth can be drilled with complete safety to the drilling crew.

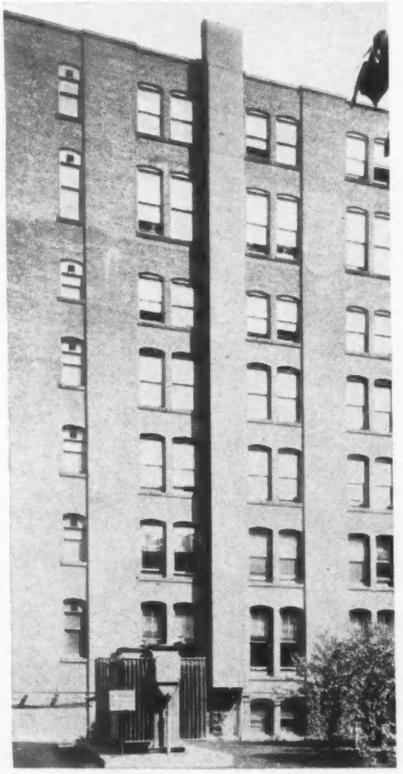
Operating results from this deep grounding are yet to be determined.

Exterior Feeds Solve Rewiring Problem

A.c. distribution at intermediate voltage simplifies capacity increase and changeover from overloaded d.c. system in a factory office building

A. H. FISH, Construction Engineering Department, General Electric Co.

THE General Electric Company recently was confronted with the necessity of materially increasing the capacity of the electrical distribution system in one of its main plant office buildings. This necessity was due in part to the gradually increasing consumption of electricity in the building over a period of years, which finally resulted in rather heavy overloading of the existing system, and in part to the increasing demand for a higher level of illumination in the office areas. As a survey indicated that a major operation was in order, including the replacement of all building feeders, distribution cabinets and switchboards, it was decided also to change the supply from direct to alternating current.



UNDERGROUND FEEDERS run from outdoor unit substation to inclosed risers on exterior of rear building wall

The distribution was 250/125 volts, three wire, direct current, supplied from a power station located approximately one quarter of a mile away. The incoming service mains were connected to two feeder distribution switchboards located in the basement. From these switchboards feeders radiated horizontally to six points in the basement; from there they ran vertically to the uppermost floor. These feeders supplied energy to 48 distribution panelboards located on the several floors of the building. From these cabinets branch circuits in steel conduit, installed in the concrete floor slabs, were run to wall and ceiling outlets.

Numerous surface extensions from these branch circuit outlets had been made to improve illumination. These extensions, of course, in time resulted in overloading the branch circuit conductors as higher wattage lamps were substituted.

The Reasons

The decision to convert the existing direct-current distribution to alternating current was based on the following considerations:

1. The aversion to purchasing and installing additional a.c. to d.c. conversion equipment which the increasing loads would require.

2. Higher conversion efficiency of a straight a.c. system. At the time the original installation was made considerable direct current was generated in the power station, while at present all d.c. is obtained by converting from a.c. by means of motor-generator sets or synchronous converters.
3. Closer voltage regulation would be possible.
4. To obviate the necessity of installing large size feeders by permitting the operation of the feeders at a higher voltage level than that at which the lamps are operated.
5. To provide a satisfactory supply for the operation of fluorescent lamps.

An extensive survey was made to determine:

1. Where the main step-down transformers from the 13,800-volt supply could be located.
2. Where the feeder switchboard could be located.
3. How the space required for the installation of the new feeders to the various distribution panels was to be obtained.
4. How the program could be carried out with a minimum of inconvenience to the building occupants.

The survey indicated there was no space available for the installation of the necessary transformers and switchgear within the building without dislocating some firmly established occupancy. It was also found that no space could be obtained for the installation of larger feeders except by the cutting of concrete floors. The noise and dirt resulting from this and other necessary alterations would have inconvenienced the building occupants considerably.

To overcome these anticipated difficulties it was decided to install an outdoor load center unit substation, including the main stepdown transformers and feeder switchgear, at the rear of the building. This substation consists of two 1,500-kva., 13,800/575-volt, three-phase, "Pyranol"-filled transformers. Installed between the transformers is an outdoor switch-house containing the transformer secondary and feeder air circuit breakers.

Double Feed

Each of the transformers is connected to a separate 13,800-volt underground cable. Only one of the transformers is needed to handle the building requirements; the other is kept as a reserve unit. In view of the high degree of reliability of modern transformers it was decided to equip only the transformer in use with regulators. Built-in automatic induction-type voltage regulators were installed in the same tank with the transformer.

From the substation 575-volt, three-phase feeders were run underground to points on the rear of the building as near as possible to those locations where the original building feeders ran upward to the distribution cabinets on the various floors. At each of these locations on the outside wall a steel housing or duct approximately 3 x 6 ft. was installed. Running vertically up the outside wall from a point a short distance above grade to the roof, these ducts house the 575-volt, three-phase feeders carried upward in 3-in. conduit. Each of the ducts is equipped with a landing corresponding approximately to the level of the building floors and with a permanent service ladder running from grade to roof.

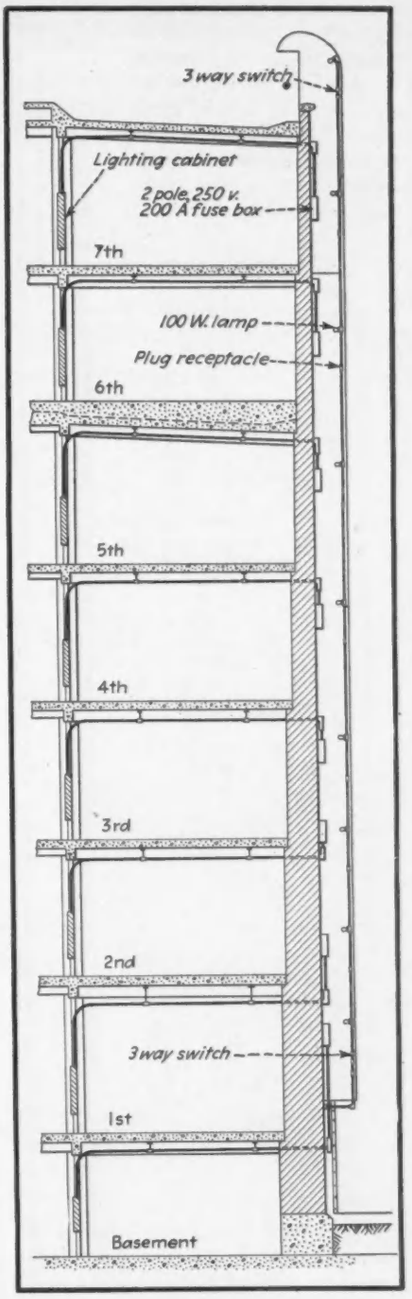
At all landings 575/250/125-volt, three-wire secondary, single-phase, air-cooled transformers of either 25-kva. or 37.5-kva. capacity are installed, together with the necessary feeder junction boxes, inclosed primary safety switches and fuses and inclosed secondary fuses.

No Secondary Ties

From each secondary fuse box a short run of 2-in. conduit passes through the building wall to its respective distribution cabinet located in the building corridor. Each cabinet is fed only by the secondary of a single transformer. No interconnections with the transformer secondaries was considered justifiable.

Vertical ducts are provided with suitable screened openings at top and bottom for ventilation. They are accessible from the grade or roof through doors provided with spring locks to prevent the entrance of unauthorized persons. Each landing is provided with a hinged steel door, normally held open by a hook, which can be closed readily by anyone in the duct to shut off draft in case of emergency. This precaution was felt essential as the ducts are approximately 100 ft. high and the only exits are at the top and bottom. The only combustible material installed in the ducts is the transformer and cable insulation, and the latter in turn is installed in steel conduit throughout.

Feeder cables between the outdoor load-center substation and the vertical ducts are No. 3/C, 300,000 cir.mil of the varnished cambric leaded type. At the first junction point in the ducts this cable is spliced to three No. 1/C, 300,000-cir.mil riser cables

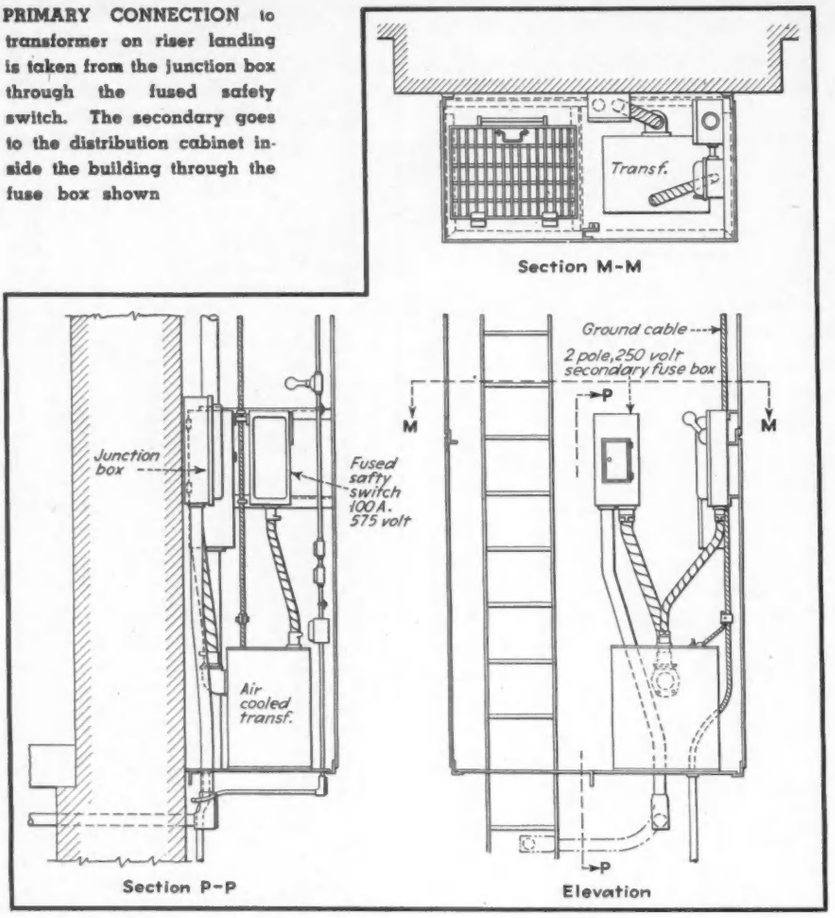


DISTRIBUTION POINTS on each floor are fed from individual transformers installed in riser housing

insulated with high temperature, moisture-resisting "Versatol" rubber. In each of the feeder junction boxes are installed three Trumbull "Anchor Taps," which serve as anchorages for the riser cables and also as connection points for the distribution transformer tapoffs.

New Type Conductors

Old fused-type distribution cabinets in the building were replaced by new ones equipped with circuit breakers. Much of the branch circuit wiring



PRIMARY CONNECTION to transformer on riser landing is taken from the junction box through the fused safety switch. The secondary goes to the distribution cabinet inside the building through the fuse box shown

had to be replaced. This was accomplished in part by installing larger branch circuit "Flamenol"-insulated conductors in the existing conduits in place of the old code rubber-insulated conductors. Other cases were handled by running additional circuits from the distribution cabinets.

The complete changeover was carried out with no service interruption during office hours or other inconvenience to the building occupants. The main substation, distribution feeders, distribution transformers and inclosures, being on the outside of the building, were all installed in normal daylight working hours. The small amount of work involved indoors, including the replacement of distribution cabinets, replacement of branch circuit wiring, etc., was carried out by a small night force.

Introduction of the intermediate voltage level for the distribution feeders provides an economical and very satisfactory method of keeping down feeder voltage drop without installing excessive amounts of feeder copper.

Use of 575 volts as the intermediate voltage level and 250/125 volts as the utilization voltage in this installation, instead of 480 and 240/120 volts, respectively, is due entirely to their general use over a period of years in the plant distribution system. Changing to the more modern voltage levels would have worked considerable hardship since the utilization equipment would not be interchangeable between plant and office building, thus making necessary a special stock of such equipment for office building use only.

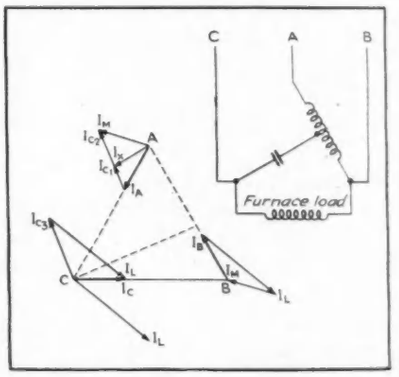
Although a number of the features of this installation were born of necessity, it is felt that in addition to the facility and absence of inconvenience to the building occupants with which the reconstruction was carried out, the general design merits consideration from the standpoint of the flexibility introduced. Future alterations and additions can readily be taken care of without disturbing the occupants. It also assures that the seemingly endless alterations carried on in this type of building to accommodate the requirements of the occupants can be executed without any interference with the major electrical distribution system.

Three- to One-Phase Transformation

IT IS not the case that only by the use of rotating machinery can perfect phase transformation be accomplished. Under certain conditions perfect balance can be attained by means of static apparatus which enables energy to be stored by means of condensers and chokes, thereby converting fluctuating single-phase power into a constant power three-phase system.

There are certain limiting conditions to practical applications. The parameters of the apparatus are the inductance and electrostatic capacity. Since these are fixed, it follows that the load parameters, namely, resistance and power factor, must also be fixed. This implies a constant-impedance variable-voltage system; *e.g.*, electric furnaces and welders.

The apparatus cannot be applied to the ordinary lighting circuits, which constitute a variable impedance constant voltage system. However, it is the loads due to welding apparatus and single-phase furnaces which give the most concern to supply authorities. A. L. Morris in *Electrical Review*, London, England.



The three line currents I_A, I_B and I_C in the vector diagram are not only equal in magnitude but are also correctly oriented with respect to each other. I_A is the vector sum of the reactor magnetizing current I_X and the appropriate condenser current component I_{c1}. I_B is the vector sum of I_X, the load current of I_L and the other condenser current component I_{c2}. I_c is the vector sum of the total condenser current and the load current.

A phase displacement of 30 deg. between the supply currents and their respective three-phase line-to-neutral pressures indicates an inherent power factor of 0.866. Thus the apparatus is capable of transforming a single-phase load at any power factor into a three-phase one at a power factor of 0.866. Further power-factor improvement may then be obtained by means of a three-phase condenser bank.

Duquesne Light Launches Appliance Service Plan

Education of users in appliance conservation, enlistment of dealers and training of service men are components of Pittsburgh program to make electrical appliances serve for the duration

G. W. OUSLER, Duquesne Light Company, Pittsburgh, Pa.*

SHORTAGE of man-power. Insufficiency of knowledge of service problems among dealers. Lack of public appreciation of the necessity to keep electrical appliances in good operating shape. Those were the three bad spots discovered by Duquesne Light Company upon examination of the local appliance service picture in the light of wartime conditions. How the company set about to cure the three bad spots is the meat of this story.

Diagnosis must always precede remedy. Therefore, before telling about the measures to cure the bad spots it is logical, and useful, to explain how they were discovered.

From a comprehensive residential market survey made in 1939, supplemented by records of sales in 1940 and 1941, Duquesne Light knew the numbers of electrical appliances on its lines, also the approximate ages of them. More than a million motor-driven appliances — washers, refrigerators, vacuum cleaners, etc. About a million heating devices — ironers, toasters, waffle irons, roasters and the like. Over 400,000 radios. And many thousands of portable lamps. All owned by 323,000 residential customers who had to be convinced of the necessity of good care for them because there weren't going to be any more until the war was over. That was the user side of the picture. It emerged pretty clearly last fall and winter when washing machine factories began converting to production of machine guns, when toaster makers began turning out shell fuses.

Next came a look at electrical dealers, distributors and manufacturers in March and early April. What facilities did or would they have available to keep those millions of appliances working for the duration? This survey revealed that:

Approximately 266 of the 359 appliance dealers surveyed were classified as being in the service business.

Practically all of these service establishments had more work than they could handle.

The average dealer had a satisfactory stock of merchandise and, though aware of the serious situation, was entirely undecided on plans for the future of his business.

With few exceptions, none of the service establishments were interested, at that time, in a promotional plan that would increase the amount of service business.

About 50 percent of the service establishments either were losing men to the armed services or war industries or were anticipating a shortage of man-power in the near future.

Most of the dealers limited their services to those makes of appliances that they sold, but indicated that it would probably be necessary to repair all makes in the future.

Distributors of parts were well stocked due to foresight on their part.

Very few manufacturers had set up any definite plans for taking care of future service business. Training programs, promotional plans, data sheets, etc., were in the making but not ready for release.

From the data on appliances in users' hands and from the studies of facilities for keeping them in use came the three conclusions earlier stated — man-power for appliance servicing was short; dealers did not know very much about how to handle

ANNOUNCEMENT of training courses in public schools

DEALERS discuss the Appliance Service Plan

*Vice-president in charge of sales.

APPLIANCE service training takes in the ladies, too

the servicing job; users were not much concerned.

To cure these conditions Duquesne Light got busy in two directions. One was customer education, a requirement that is plain to all utilities and which has been given attention by many. In the view of Duquesne Light, this requirement has a double aspect —to promote good treatment and care of electrical appliances so as to avoid necessity for repairs and to give the public an understanding of the service man's problems, thus to build up his prestige as a local business man. Newspaper space, radio spots, billboards, street car cards, window displays, electric bill advertising, dealer window posters, all the ways of reaching the public, carry the message, "Keep your electrical appliances in good working condition; see your electric service dealer for repairs."

But shortage of service man-power and enthusiastic enlistment of dealers in service work were matters that had to be handled differently from user education. An "Appliance Service Plan" was set up in two parts, a service training program as both an answer to the man-power shortage problem and a means to increase the skill and efficiency of present employees of dealers, plus a program of cooperation with dealers to assist them in the servicing job.

The service training program is best described by quoting directly from the announcement of it by the Pittsburgh Board of Public Education. The board readily espoused the idea when it was brought forward by Duquesne Light. Shown in an accompanying illustration is the front cover of the announcement of the program to dealers, which bears a message from Gerald D. Whitney, associate superintendent:

"We face the gravest national crisis in our country's history. In this emergency the Pittsburgh Public Schools are fully prepared to give practical assistance and inspiration to all classes, creeds and races throughout our community."

The inside pages contain numerous pictures of pupils receiving instruction in addition to the following information on the program:

1. Each training course will run 90 hours. This time will be divided between shop work and classroom instruction.
2. Courses are open to the public. No tuition is required.
3. Courses are scheduled at times suitable to those attending schools, or already engaged in other work.
4. Because of the loss of experienced men to the armed forces and war industries, these Electric Appliance Service Courses will appeal particularly to school youths, 16 to 17 years old, who could be granted working certificates; to older men not employable by war industry, and to women.
5. Physical examinations and mechanical aptitude tests are given before registration . . . and certificates are awarded to those who successfully complete the course.
6. Instructors in these courses are qualified teachers with mechanical background and practical experience in their chosen fields.
7. Schools where program will be offered: Allegheny and Washington Vocational High Schools.

Course Outline

1. Elementary Electricity. Theory of electrical generation and distribution. Wiring circuits and symbols—10 hours.
2. Electrically Heated Appliances. Theory and shop work on irons, coffee makers, waffle irons, grills, roasters and ranges—10 hours.
3. Vacuum Cleaners. Theory and shop work on stationary and rotary brush cleaners. Mixers and other small motor appliances—10 hours.
4. Washing Machines. Theory and shop work on wringer, dryer, and automatic washing machines. Refinishing and spray painting—10 hours.
5. Ironers. Theory and shop work on console, wringer post and table top ironers —6 hours.
6. Motor Repair. Theory and shop work on split-phase, repulsion-induction capacitor and polyphase motors—10 hours.
7. Radio Service. Theory and shop work on minor radio repairing, tube testing, push-button setting, condenser and resistor testing—12 hours.
8. Refrigeration Service. Theory and shop work on minor refrigeration repairing. Checking motors, controls, relays. Refinishing cabinets—12 hours.
9. Trouble Shooting. Theory and shop work on methods of determining troubles in appliances—10 hours.
10. Service Business. Estimating repair charges, profit, overhead, serviceman's approach, attitude, appearance. Service tools and shop equipment. Safe work methods—4 hours.

Repair Parts Information

The program of cooperation with dealers included as a principal item the furnishing to them of information on where to obtain necessary repair parts. The required information was obtained from manufacturers and distributors and compiled into a complete directory of names, addresses and telephone numbers of local outlets arranged according to different appliances and their makes. This directory was printed on one side of a large single sheet of extra-heavy paper so that it could be tacked on the wall of the dealer's shop and consulted with a glance.

Another important element in dealer cooperation is an information bureau set up in the company under an experienced service manager. To this bureau a dealer can apply for help in any service problem—difficulty in securing particular repair parts, need for technical information or manufacturers' data sheets, etc.

Especially helpful in maintaining close relations with dealers is the company's publication, "Electrical Service News." As stated on its front page, "This bulletin is issued as a clearing house for service ideas, current parts information, government regulations and other items of interest to the electrical dealers." Printed in newspaper style, this eight-page periodical is filled with personalized news stories about dealer activities and about developments affecting dealer business.

The Appliance Service Plan, com-

plete in all its aspects—user education, training of service men and cooperation with the trade—was announced in a series of eleven dinner meetings, one with manufacturers and distributors and ten with dealers in various communities served by the company.

What has been accomplished by the plan? It is too early yet for any comprehensive reply to that question. Probably it will never be possible to make a wholly complete and categorical statement of results. But it is possible now to judge the plan by its acceptance, and from that to feel confident of its great usefulness. As of July 14, 103 students were enrolled in the appliance training course in the two Pittsburgh vocational high schools which began the first week in June. Two schools outside of Pittsburgh will start the course in September. Practically all of the students now enrolled are either dealer employees now or have been assured employment on successful completion of the course.

Dealers are enthusiastic about the repair parts directory, which not only saves them much time in obtaining needed parts but which also helps them to extend their service operations to makes of appliances other than only those they sell or have previously specialized in. The information bureau is busy every day assisting dealers in improving their service facilities and in expanding their businesses. From these evidences it is plain that the Appliance Service Plan has much merit and usefulness.

Distribution and Supply System Voltage Need Coordination

Proper coordination of distribution system voltage requirements, operating range of voltage regulators, available taps on distribution supply transformers, transmission supply voltages will go far to correct inadequate service voltage

C. E. ARVIDSON, Commonwealth & Southern Corporation, Jackson, Mich.

FEW utility company engineers will take exception to the concept that the voltage requirements of the distribution system should dictate the voltages to be maintained on the power supply systems and at the distribution substations. But it is questionable whether some engineers follow these conceptions through in selecting new equipment and using existing facilities.

Available voltage data indicate the probability that some engineers may not be giving sufficient attention to the proper coordination of distribution system voltage requirements, operating range of voltage regulators, available taps on distribution supply transformers, transmission supply voltages, etc. It is also apparent that some engineers have begun to realize only within the past few years that the voltage ratings of the secondaries of distribution substation supply transformers should be higher than the ratings of distribution transformers in the same voltage class.

During the present emergency it may be necessary for utility companies and their customers to condone service voltages which may not be entirely adequate. However, such conditions should not be tolerated until optimum use of existing facilities has been made. Therefore, this should be an opportune time to review some of the principles which must be recognized if the distribution and power supply system voltages are to be properly coordinated.

Basic Considerations

The important concepts which should be foremost in the minds of those responsible for maintaining adequate system voltages are:

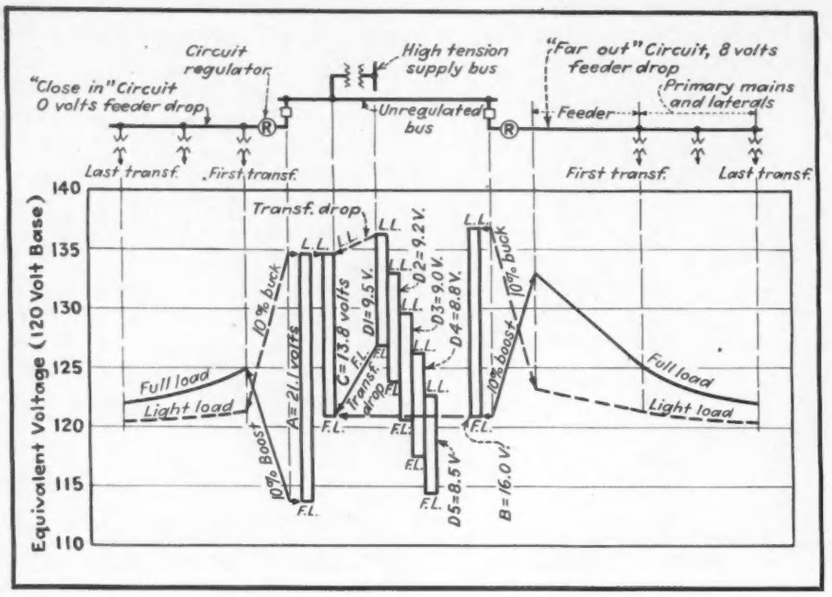
(a) System *voltage levels* are controllable by the proper specification and use of variable transformer ratios (transformer taps), uncontrolled shunt capacitors and bucking or boosting transformers.

(b) System *voltage regulation* (light load to full load) may be improved by "negative regulation" of the generator voltages and by effective use of tap changing under load transformers, voltage regulators, synchronous condensers and controlled shunt capacitors.

(c) Voltage *level* and voltage *regulation* may be considered separately except in so far as improper voltage levels sometimes prevent the use of the full regulating range of voltage regulating facilities. The unregulated voltage level should be such that the voltage regulating equipment can buck the light load and boost the full load voltages the desired amount.

Voltages required at distribution substations are governed by the voltage requirements and the characteristics of the distribution system served therefrom. Maximum *regulated* voltage at any distribution substation is required during full load conditions and is equal to the maximum distribution primary voltage desired at the feed point, or first transformer, on the distribution circuit, plus the *greatest* full-load, feeder-voltage drop. The corresponding minimum *regulated* voltage is usually required during light load conditions and is equal to the desired no-load primary voltage (contact-making voltmeter setting on regulator) plus a light load/full load percentage of the regulator compensation on the circuit having the *smallest* feeder voltage drop.

The regulated voltages defined require that the *unregulated* bus voltage be kept within limits such that circuit regulators involved can buck the maximum light load unregulated voltage, or boost minimum full load



CASE I—Voltage profile for substations using ± 10 percent regulators

A—Maximum permissible unregulated bus voltage spread and limits for circuits having 0 volts feeder drop.

B—Maximum permissible unregulated bus voltage spread and limits for circuits having 8 volts feeder drop.

C—Maximum permissible unregulated bus voltage spread and limits for substations serving circuits with 0—8 volts feeder drop.

D1—High tension voltage limits equivalent to (C) with transformer tap setting on full winding.

D2—High tension voltage limits equivalent to (C) with transformer tap setting on 2½ percent tap.

D3—High tension voltage limits equivalent to (C) with transformer tap setting on 5 percent tap.

D4—High tension voltage limits equivalent to (C) with transformer tap setting on 7½ percent tap.

D5—High tension voltage limits equivalent to (C) with transformer tap setting on 10 percent tap.

unregulated voltage to the regulated values required for the various distribution circuits. During light load conditions the maximum unregulated bus voltage at the distribution substations should not exceed the minimum regulated voltage, defined above, by more than the ratio of 100/90 where ± 10 percent regulators are used, or by more than the ratio of 100/95 where ± 5 percent regulators are used. Similarly, the minimum unregulated bus voltage during full load conditions should not be less than 100/110 times the required maximum regulated voltage where ± 10 percent regulators are used, or less than 100/105 times the maximum regulated voltage where ± 5 percent regulators are used.

Light load and full load voltages on the high-tension side of the distribution substation supply transformers must be sufficiently higher than the values obtained by multiplying the required unregulated bus voltages by the transformer ratio to provide for the voltage drop in the substation transformers. *Voltage taps in the high-tension (and/or low-tension) transformer winding should be used to select that ratio which will place the high-tension supply voltages in the proper relation to the unregulated low-tension bus voltage requirements.*

Substation Requirements

The voltage requirements at distribution substations can best be realized by working out examples for specific cases. Assume, for sake of illustration, Case I, where:

(a) The distribution substation in question supplies several circuits having full load feeder voltage drops ranging in magnitude from 0 to 8 volts.

(b) The full load distribution primary voltage required at the feed point or first transformer is 125 volts ± 1 volt (±1 volt representing contact making voltmeter band setting).

(c) The desired no load distribution primary voltage is 120 volts ± 1 volt, representing the voltage at which the contact-making voltmeters are balanced.

(d) The characteristics of the circuit loads and the total substation loads are such that the light load is approximately 25 percent of full load.

(e) The substation supply transformers have a no load to full load regulation of 5 percent for the assumed load and the high-tension windings are provided with four 2½ percent taps.

(f) The operating range of the individual feeder voltage regulators is ± 10 percent.

For Case II, assume the same conditions except that the operating range of the regulators (item f) is ± 5 percent.

The arithmetical determinations of the required substation voltages for these two assumed cases are given in the accompanying table and the results are shown graphically in the accompanying illustrations.

These examples should be studied together with other similar examples in order thoroughly to comprehend the interrelationship of feeder voltage drops, unregulated bus voltages, high-tension supply voltages and regulating range of regulators.

It can be seen from the illustrations that the proper coordination of substation voltage requirements and power supply system voltages must take into consideration both the voltage *level* and the light load to full load voltage *regulation* of the power supply system together with the facilities for controlling these factors.

Correlation of Voltage Levels

As previously stated, the purpose of taps in the high-tension (and/or low-tension) transformer windings is to provide a means of selecting that ratio which will place the level of the high-tension supply voltages in the proper relation to the low-tension voltage requirements. In some cases the available distribution substation transformer taps may be unsuitable for the proper correlation of the high-tension and low-tension voltage levels. This may be due to improper ratios having been specified when the transformers were purchased or it may be due to power supply system voltage levels which are too high or too low for best system operation. In either case studies should be made of transformer tap settings at step-up and step-down transmission substations for the purpose of adjusting the relationship between generator and transmission voltage levels so that the voltage level requirements of most distribution systems can be satisfied.

Even though the voltage level of the power supply system has been investigated and improved, the voltage level at some particular substation may still be too high or too

low. In such cases there are other possible expedients which should be considered, such as:

(a) Interchanging substation supply transformers to obtain more suitable transformer ratios for the critical substation locations.

(b) Installing fixed bucking or boosting transformers between the low-tension terminals of the substation supply transformers and the low-tension unregulated bus.

(c) Installing uncontrolled shunt capacitors on the unregulated low-tension bus or at the feed points of the distribution circuits having the greatest feeder voltage drop.

Regulation of Supply Voltages

In some cases the light load to full load regulation of the high-tension supply voltage is too great to satisfy the voltage requirements at the distribution substation; studies should be made to determine how the regulation of the power supply system can be improved by making optimum use of existing equipment. All possibilities should be considered including:

(a) Varying the generator voltages with the load; *i.e.*, providing "over-compensation" or "negative regulation" of the generator bus voltages.

(b) Taking full advantage of existing regulating facilities on the power supply system such as synchronous condensers, tap changing under load transformers, etc. These should be operated throughout the full buck and boost range if necessary.

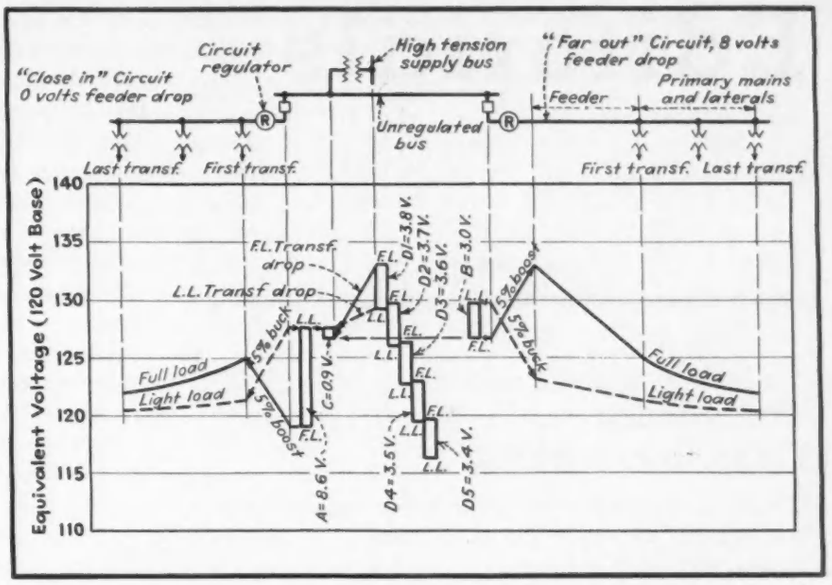
Should the regulation of the high-tension supply at the distribution substation be too great, even though existing facilities are being used to the fullest extent, the following expedients should be given consideration:

(a) Install *controlled* shunt capacitors on the low-tension bus of the distribution substation or at the feed points of the distribution circuits having the greatest feeder voltage drop.

(b) Install synchronous condensers or additional regulating equipment at critical points on the system.

(c) Construct additional transmission lines to the critical substations.

(d) Increase transmission system voltages by changing from delta to wye operation.



CASE II—Voltage profile for substations using ± 5 percent regulators
For legends see figure for Case I.

A thorough understanding of the voltage requirements of each particular distribution system and of the voltage improvement possibilities offered by various types of equipment will enable the engineer to make maximum possible use of existing facilities. In cases where the power supply system is relatively "stiff" the distribution engineer can take advantage of this condition by permitting greater feeder voltage drops if necessary, or should the distribution system have relatively small feeder drops, greater regulation can be allowed on the power supply system.

Furthermore, it may be possible in some cases to improve the regulation of the power supply system to such an extent that additional distribution circuit regulator capacity can be obtained by reconnecting the regulators to ± 5 percent operation. These are only a few of the opportunities which will "knock at the door" of the engineer who thoroughly understands the problem of coordinating distribution and power supply system voltages.

Voltages Required at Distribution Substations

(All voltage values expressed in terms of 120-volt base)

	Case I ±10% Regs	Case II ±5% Regs
1. Required voltage at primary of 1st distribution transf..	125	125
2. Desired no-load pri. voltage (regulator CMV setting)...	120	120
3. Operating range of voltage regulator, percent.....	±10	±5
4. For dist. circuits having 0 volts feeder drop		
(a) The *required regulated* voltages at substation are:		
at full load, 125 + 0 volts feeder drop.....	125	125
at light load, 0.25 (125 − 120) + 120.....	121.25	121.25
(b) The *required unregulated* bus voltages are:		
at full load, *not less* than 100/110 x 125.....	113.6	.....
100/105 x 125.....	.....	119.0
at light load, *not more* than 100/90 x 121.25...	*134.7	.....
100/95 x 121.25....	.....	*127.6
5. For dist. circuits having 8 volts feeder drop		
(a) The *required regulated* voltages at substation are:		
at full load, 125 + 8 volts feeder drop.....	133	133
at light load, 0.25 (133 − 120) + 120.....	123.25	123.25
(b) The *required unregulated* bus voltages are:		
at full load, *not less* than 100/110 x 133.....	*120.9	.....
100/105 x 133.....	.....	*126.7
at light load, *not more* than 100/90 x 123.25....	136.9	.....
100/95 x 123.25....	.....	129.7

	Case I ±10% Regs	Case II ±5% Regs
6. *Required unregulated* bus voltage at substation serving several dist. circuits having feeder drops of various magnitudes from 0 to 8 volts		
at full load, *not less* than (limited by Item 5b*)....	120.9	126.7
at light load, *not more* than (limited by Item 4b*)..	134.7	127.6
7. *Required high-tension* voltage at dist. substation (assume 5% drop through transformer at full load and 1¼% at light load)		
H.T. Voltage = Item 6 $\left(\frac{100 + \%\text{ transf drop}}{100}\right) \times \left(\frac{100 - \%\text{ tap setting}}{100}\right)$		
(a) 0% tap (full wdg) — at full load, not less than....	126.9	133.0
at light load, nor more than.	136.4	129.2
(b) 2½% tap — at full load, not less than.....	123.8	129.7
at light load, not more than.....	133.0	126.0
(c) 5% tap — at full load, not less than.....	120.6	126.3
at light load, not more than.....	129.6	122.7
(d) 7½% tap — at full load, not less than.....	117.4	123.0
at light load, not more than.....	126.2	119.5
(e) 10% tap — at full load, not less than.....	114.2	119.7
at light load, not more than.....	122.7	116.3

Note.— All voltage values are subject to tolerance of ± 1 volt (CMV setting).

* See Item 6.

Editorials

S. B. WILLIAMS, *Editor*

"Retardation" of Fluorescent Lighting

CHARGES that electric utilities and manufacturers operated together to retard the development of fluorescent lighting were made to a Senate committee on August 18. The now so familiar methods of blanket accusation, innuendo, implication and partial truth, so useful to newspaper headline writers, were employed in the usual spectacular fashion, intended to make the people believe that business is the villain of the piece.

Whether or not the accused are guilty of the high crimes and misdemeanors charged against them, it can safely be said that the alleged fell purposes were not accomplished. If there was a conspiracy, it was not a success. For fluorescent lighting, considering its initial deficiencies, its differences from firmly established lighting practices and the fact that it ran into difficult times very quickly, has developed about as far and as fast as could be expected. All that is required for proof of that statement is a little reflection on what fluorescent lighting was and is.

The new kind of lighting became commercially available in limited quantity and for restricted uses in 1938, only four years ago. The terms of its introduction were largely of improvement in colored lighting for decorative purposes. It was not announced as sounding the immediate doom of incandescent lighting, which is the impression of the way the new thing burst on the world that is sought to be conveyed by the accusers in and before the Senate committee.

Fluorescent lighting emerged from the laboratory too soon, before it was really ready for anything but purely experimental use. Tricky problems of light quality caused expensive difficulties in many early installations. Necessary auxiliary equipment, fittings and reflectors, many of them poorly, because hastily, designed, were rushed into production. As a matter of fact, a great part of the invention in these necessary items which have made fluorescent really practical occurred *after* the new illuminant was put on the market.

Different from incandescent in sizes and shapes of units, in color and quality of light and in operating characteristics, fluorescent lacked an engineering technique for its application. It did and does require a money outlay for installation as well as a money loss, often large, caused by the scrapping of existing lighting equipments.

It is to be remembered also that manufacturing facilities for production of fluorescent tubes, auxiliaries and associated equipments were not and are not now sufficient to turn out the volume required for complete substitution of incandescent lighting, even if users wanted it and were willing to pay for it.

Finally, fluorescent lighting, like so many other new things already started or just a-borning, is a casualty of war. Its development and application have been and are greatly hindered by the controls and restrictions of wartime.

It is plain, therefore, that any retardation seen in the development of fluorescent lighting during its yet short career of hardly more than four years is caused by conditions wholly outside the control of those accused of holding it back. And, considering the difficulties it encountered at and following its debut, any one informed on the matter must conclude that fluorescent has made remarkably long and rapid strides toward its rightful place in the art of lighting.

Network War Loads

FOR densely populated metropolitan areas the low-voltage underground network system is accepted as the most economical method of providing highest standards of service constancy. But the very method of feeding such networks by means of 13- and even 27-kv. feeders carries some obstacles to their extension as radial feeders to serve war industry loads in or near the network area. Not only is there the risk of failure of cables in normal loading and overloading but there is the occasional necessity of de-energizing the network feeders to do work on them or at their terminals and tapped points.

These arranged outages are for adding, removing or replacing transformers or for the purpose of extension or rerouting of the cable in addition to the normal routine of maintenance to the cable itself or its appurtenances. Such outages commonly occur as often as once a month, and at times may last a half day or more, not only to do the required work but also to cover the necessary identification tests for fault locations, grounding and discharge of static. These operations take considerable time because cable vaults are often congested and every precaution must be taken for safety of the crews. None of these individual feeder outages need involve outage of the network loads because there are numerous other feeders that carry the load during the contingencies as well as in normal operations.

Up to certain limits blocks of distributed war industry load can be served directly off the established low-voltage network at a minimum incremental cost and with the minimum use of new materials. Extension of network service to large concentrated loads, however, calls for installation of greater quantities of equipment than would be required for a radial installation. Radial service from two interlocked feeders can achieve a saving in transformers, but requires a considerable outlay in switching equipment, which encounters stringencies of supply and

priority. The maximum saving of materials is achieved by providing radial service from single high-tension underground feeders. For the consumers this means an occasional outage interrupting production; for the power company, there is the additional burden in arranging for the minimum occurrence and duration of outages of feeders serving radial loads. The problems presented thereby are complex, but not insuperable.

The low-voltage underground network is one of the outstanding developments of American power practice for providing continuous supply to high-density distributed loads at the lowest average cost. For new concentrated loads, however, it requires a larger incremental investment, in cost as well as in materials, than a radial system.

Indicted

THE INDICTMENT on criminal charges of conspiracy to defraud in sales of electric power cable to the Navy, brought this month by a Federal grand jury against nine manufacturers and against six officers of the accused companies, is a shocking event. Statements by the companies point out that the allegedly wrongful acts were performed with complete faith in their legality, that they were known to and unchallenged by the Navy for years and that the Navy paid no more for cable than any other buyer.

It will be hard for men in the electrical industry who have done business with the indicted companies for many years and who are acquainted with the men named in the charge to believe that any willful wrongdoing was either performed or contemplated. Rather they will fear, perhaps, that the novel constructions put upon laws in these latter days may make snares for their own feet and will be inclined to say with a great English leader, "But for the grace of God, there goes John Bradford."

Worthy of note is the coincidence that, on the same day the indictment was opened in the United States District Court, the Attorney-General of the United States, speaking at the annual meeting of the American Bar Association, is reported by the New York "Sun" to have "called upon the peoples of the United States and Canada to brush away the hesitations, distrusts and jealousies that he said were delaying the ultimate victory of the democracies." It can hardly be said that the indictment of the nine cable manufacturers will be of any help in brushing away such feelings.

Silver for Contacts

SILVER was recognized and applied as peculiarly advantageous for electrical contacts long before other metals got scarce or silver got to be so relatively plentiful as to be used for buses and transformer windings. Now, however, that we have such a store of it available for industrial uses, every reasonable advantage should be taken of both its availability and its favorable electrical characteristics. Electrically and thermally, silver stands at the top in conductivity. It does not oxidize readily and such oxide as is formed reverts to metallic silver at about 300 C. A surface sulfide is not bad because it, too, has relatively good conductivity. Even where silver's softness and fusability are offset by addition of 7 to 10 percent of copper, the alloys when properly heat treated have good electrical and thermal conductivities. If severe or repetitive arcing demand the alloying with molybdenum or tungsten it is readily possible to use sterling- or coin-silver supplementary contacts to carry the working currents with minimum heating.

Contacts in relays and circuit interrupters can be in critical places in power circuits that should clear when something goes wrong elsewhere, but they should carry the normal working currents coolly and calmly. Wherever the increased duty, as to load current or frequency of interruption and arcing, makes the contacts a dubious element in the circuits they control or protect, it would be well to modernize with silver, a metal pretty well preordained for contact-making, contact-holding and contact-breaking functions. It does not take much.

The End of an Argument

" 'TIS SO." " 'T'ain't so." Arguments of this type have two ways of ending. One is by exhaustion of the participants. The other is by forced termination. It is in the latter way that the controversy over adequacy of national electricity supply is now concluded.

WPB, after exhaustive study of the matter by its Power Branch, recently issued orders which set something over 5,000,000 kw. as the limit of electric system capacity additions for the duration. The Power Branch was not bothered by any consideration of "enough" electricity; it simply went to work to determine how greatly electricity supply could be enlarged with the materials available for the purpose. WPB wasted no time on the question of how much electricity will be enough, but concentrated on the problem of getting as much as possible, giving due regard to other requirements laid on manufacturing facilities and on stocks of materials.

There never was any sense to the argument anyway. No one could tell how much electricity would be needed for war production because no one knew or knows what the war production will be. Furthermore, as has been previously pointed out on the editorial pages of this publication, it is impossible to establish competent over-all ratios of translation from estimates of war production in dollars to figures of electricity requirements in kilowatts and kilowatt-hours. Studies, surveys, investigations were made in attempts to set up such ratios, but the results were not in agreement among themselves and one cannot avoid the strong suspicion that intentions were oftener to bolster a thesis than to find a truth.

Mediaeval schoolmen disputed on how many angels could stand on the head of a pin. The controversy on adequacy of electricity supply for our nation at war equaled those monkish arguments in futility. The industry will breathe a sigh of gratitude at its ending.

Washington Comment

GEORGE E. DOYING, JR., Washington Correspondent

Railroads Set Green Light for Deferred Maintenance

THE Interstate Commerce Commission has established a procedure for steam railroads which recognizes wartime maintenance that must be deferred, because of inability to obtain materials or labor, as a legitimate current operating charge.

The set-up makes it possible to prevent the increasing percentage of normal maintenance budgets which cannot now be spent due to the war from artificially inflating company income at a time when excess profits and corporate income taxes are soaring. Also, the plan provides a means whereby the railroads can build up a "nest egg" to spend on worthwhile projects after the war and help cushion the post-Armistice shock.

The issue of deferred maintenance is beginning to assume considerable importance financially and it inevitably will become more so as the "patch and pray" era stretches out. The need for some provision at least exempting these unexpendable charges from taxation has been voiced by the Edison Electric Institute before the Senate finance committee. Chairman George, of this committee, indicated agreement that something should be done, but the matter may get lost.

Complete Set-up for Railroads

The ICC plan, however, is complete even to a working arrangement with the Bureau of Internal Revenue not only recognizing the deduction of the estimated cost of deferred maintenance but also covering the tax policy to apply in the future to any funds which, for one reason or another, are not spent after the war.

ICC set up its deferred maintenance procedure in July, when it became obvious that railroad budgets for repair work were running head-on into priorities regulations and labor conditions making both men and materials impossible to obtain in normal quantities. Two new accounting classifications were created, one for deferred maintenance on ways and structures, the other for similar deferment of work on equipment. A new section was added to the regulations covering the Classification of Operating Revenues and Operating Expenses for Steam Roads, which specifies:

"When so authorized by the commission, there may be included each month (in these accounts) the amount estimated as necessary to provide for the cost of repairs which the carrier finds it is unable to undertake or complete during any calendar year due to non-receipt of material and supplies because of priorities regulations or due to adverse labor conditions."

Surrounded by Safeguards

ICC has protected its plan against abuse. The commission requires a bill of particulars for each individual deferred project in the form of a certificate from the engineering or mechanical department of the railroad specifying both the work which cannot be done and the estimated cost. These certificates are to be kept on file and expenditures can be charged against deferred accounts later only for these previously identified jobs. Meantime, the unspent money must be retained in cash or War Bonds in the railroad treasury.

If the job turns out to cost more than the estimate, the excess cost will be charged to operating expenses of the year in which it is done. If the job eventually costs less than estimated, the excess in the reserve fund will first be charged back to the year in which the work was deferred and taxes paid at the rates then in effect as if the money were taxable income —then, the remainder is to become a credit on the current operating expenses.

What about maintenance which cannot be carried out after the war? With ICC permission, projects will be canceled and the money which has been earmarked for that purpose will be handled in the same manner as described for excesses of estimates over actual costs; that is, first taxed as income at the wartime rates and the balance then credited to current expenses.

Why hasn't some similar program been put into operation by the Federal Power Commission for the electric utilities subject to its accounting requirements? Perhaps one answer is that the utilities themselves have not asked for such help. Another answer, however, is that the commission has been, and is, cold to any proposal which contemplates an operating deduction from revenues when the money isn't actually spent. It is recalled at FPC that, in the past, utility deferred maintenance accounts sometimes found their way into surplus after the work for which the money had been put aside was forgotten.

No Discrimination

Such a thing couldn't happen, of course, under the ICC plan, with its carefully conceived curbs requiring specific identification of deferred projects and making definite provision for handling leftover funds.

Not answered by the ICC plan is another objection of some regulating agencies today—that credits and debits to operating expense accounts in years other than when the work is done results in an unfair charge or benefit to ratepayers who aren't customers in both periods. ICC simply shrugs this one off with the statement that the amounts involved for any particular customer are too small to represent discrimination, that provision for sound maintenance is the more important consideration anyway.

This question of deferred maintenance has received attention in other quarters in Washington, also. In WPB, for instance, there is a growing number of officials who recognize the need, and fairness, of permitting utilities and other industrial concerns as well to charge into current operating expenses normal maintenance which the war regulations make impossible and to accumulate this unspent money in a War Bonds reserve to help finance the reconversion of American industry back to peacetime production. Nothing tangible has yet developed from this thinking: the flame isn't dead, only smothered by the pressing demands of the moment.

NEWS OF THE WEEK

Utilities Rid Excess Inventories by Sales

WPB listing shows $24,000,000 of material offered during second quarter — Net withdrawals much reduced from 1940

Electric utilities have responded wholeheartedly to the WPB power division's "invitation" to cure their excess inventories under Order P-46 restrictions by listing unneeded material for sale to other utilities. Preliminary tabulation of the PD-194 reports for the second quarter P-46 operations from most of the nation's utilities disclosed a total of $24,000,000 worth of material offered.

Nearly one-third of the inventories which utilities are ready to make available to other utilities needing material (ELECTRICAL WORLD, August 22, 1942, page 66) is wire, cable and busbar shapes, this group alone totaling more than $7,000,000, mostly in the form of underground cable, weatherproof and bare copper wire.

Priorities a Factor

The preliminary tabulation also discloses the sharp reduction which priorities regulations, particularly limitations upon extensions, has brought about in the normal volume of utility operations. In the second quarter utilities included in the tabulation reported a net withdrawal of material excluding fuel for private railway operations with a dollar value of $23,250,000. This compares with a dollar expenditure of $41,250,000 in the P-46 base period of 1940.

That this reduction has been largely at the expense of peacetime extension of service to new consumers is evidenced by the reports according to power division officials. This fact is further substantiated by analysis of the surplus material offered for sale—a large portion is material apparently purchased before priorities controls for type of operations.

Excluding fuel and wood poles, both exempt from P-46 inventory limitations, the utilities whose reports are tabulated showed an inventory valued at $141,500,000, only slightly in excess of the allowable P-46 base established on the basis of 1940 inventory. Most of what increase is shown is in stores of generating station materials, where a larger stock is permitted to the extent of greater output.

The dollar size of the utility inventory is misleading, but there is reason to believe that the current trend throughout WPB to tighten up on the amount of critical material in industrial stores may soon bring a reduction in the P-46 base. Power division officials realize that a large part of utility inventories consist of material which has been "frozen" by the limitations upon extensions, etc., but they are seeking an equitable method for reducing allowable inventory without straitjacketing utilities in obtaining legitimate needs for proper maintenance.

The fact that a considerable portion of utility inventory consists of special items not frequently interchangeable in maintenance work is pointed up by the report tabulation, which shows that while utilities were using $23,250,000 worth of materials for P-46 operations, in the second quarter they accepted deliveries of $21,000,000 worth of new material under order P-46.

ELECTRIC STACKING of pulpwood logs speeds delivery of this essential raw material of paper manufacture in a New England plant driven by purchased energy. The mobility and flexibility of this motor-driven equipment prove doubly valuable under war conditions where economy in the use of labor and mass handling of material shorten production time and lower costs

Extension Asked by National Power

The SEC has set September 15 as the date for a hearing on the application of the National Power & Light Co., sub-holding unit in the Electric Bond & Share Co. system, for one year's extension to comply with its dissolution order, entered August 23, 1941.

As an initial step in its program of compliance with the SEC order, National is offering to exchange two shares of Houston Lighting & Power Co. common stock for each share of National's preferred. Recently the commission granted National an additional 60 days time to exchange the stock.

Dissolution orders against two other major sub-holding units of Bond & Share—American Power & Light Co. and Electric Power & Light Co.—were entered the week previous (ELECTRICAL WORLD, August 29).

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South Carolina Merger Plan Filed

A plan for the merger of the Lexington Water Power Co. and the South Carolina Electric & Gas Co., both subsidiaries of General Gas & Electric Corp., an Associated unit, was filed recently with the Securities and Exchange Commission. The plan was described as the "first step in the over-all program of General Gas & Electric for the distribution of its assets." The plan has been submitted to the South Carolina Public Service Commission (ELECTRICAL WORLD, August 15, page 7) and hearings are scheduled to start October 6 before that body.

Under the proposed plan South Carolina would absorb Lexington and would emerge with a new capitalization consisting of 70,000 shares of $100 par common stock and 150,000 shares of $50 par preferred stock. Of this stock, General would own 123,776 shares of a maximum of 126,210 shares of 5 percent preferred stock to be outstanding and 43,394 shares of common, which would be all the common stock outstanding. Approval of these steps would be followed by offer of General to exchange the preferred stock of the consolidated South Carolina Electric for the prior preferred and preferred stocks of General.

General would obtain its major preferred interest in the consolidated company because it owns most of the preferred stock of South Carolina, which, at present, has outstanding 25,000 shares of $6 prior preferred, of which General owns 24,371 shares, and 13,105 shares of 7 percent preferred, of which General owns 12,517 shares.

Several months ago the state Supreme Court denied the South Carolina Public Service Authority (Santee-Cooper) permission to acquire the two utilities at an estimated cost of $40,000,000.

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OPA Forms New Unit to Handle Rates

OPA has just established an operating division to handle utility rate matters which will supersede and enlarge the scope of its present temporary unit. The new division will be headed by Commissioner Robert A. Nixon of the Wisconsin Public Service Commission, the only LaFollette appointee to the commission retained by Gov. Julius Heil. Harry R. Booth, who has been acting head of the temporary organization and utilities counsel for OPA, will be head of and counsel for the Public Utilities Branch of the Division under Nixon. There also is a transportation branch in the division under John H. Eisenhart, Jr., formerly with the Maritime Commission as examiner.

Establishment of a full-fledged utilities operating division in OPA apparently means a continuation of the agency's policy of petitioning to intervene in opposition to virtually all utility rate increase cases even though the price control act specifically exempts utility charges from price regulation, although selection of a state commissioner is interpreted in Washington as indicating OPA's activities will not become that of a super-federal rate-regulating agency.

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Gas Also Placed Under Restriction

An "if and when" curtailment order, similar in scope and regulations to the electric power curtailment order L-94, applying to manufactured gas has been issued by the War Production Board and will be administered by the power division. Issuance of this order brings electricity, natural and manufactured gas all under machinery for administering curtailments if and when shortages develop in specific areas.

In addition to setting up a "priority schedule" for reducing deliveries to non-war and non-domestic consumers when necessary, the manufactured gas order, L-174, carries a prohibition of installation of space-heating equipment using this fuel after September 1 except upon permission of WPB, or where the installation replaces equipment of equal or less capacity or is for a building where gas heating is specified and the foundation was in by September 1.

NEWS BRIEFS

GENERATING PLANT of the Long Island Lighting Co., which supplies power to half a dozen war production plants on Long Island, will be guarded hereafter by the U. S. Army, Col. Edward C. O. Thomas, director of civilian protection for Nassau County, has announced. Traffic on Shore Road in front of the plant on Hempstead Harbor will be rerouted and the guard will be maintained 24 hours a day. The U. S. Coast Guard will extend its patrol to include the waterfront near the plant.

THE NEW WAR TUNE "I'm a Member of the OCD" was composed by J. A. Civilett, a sales engineer for Westinghouse, specializing in lightning protective devices and surge generators.

THE NEW YORK CITY SUBWAY DIMOUT, which has caused howls of anguish to go up from city commuters, is undergoing more tests by the Board of Transportation, which is seeking some method of ameliorating the situation. So far bulb-masking has been found to be the most practical method of dimming the train lights—the only trouble being that it was too successful from the standpoint of newspaper readers.

ONE OF THE FEW INSTANCES where a municipality has been willing to sell its electric system to private interests is reported from Indiana, where the Public Service Co. of Indiana has requested the Public Service Commission for permission to buy the electric system at Paragon, Ind. In Rochester, Ind., on the other hand, citizens have begun investigation of methods whereby the city may acquire the electric distribution system from the Public Service of Indiana.

SEVEN MORE electrical manufacturing plants, bringing the total to sixteen, have been awarded the new joint Army-Navy "E" pennants. They are the American Lava Corp., Minneapolis Honeywell Regulator Co., Picker X-Ray Corp. and the Hawthorne (Chicago), Kearney (N. J.) and Point Breeze (Baltimore) plants of the Western Electric Co.

ALBERT & J. M. ANDERSON MANUFACTURING CO., pioneer maker of electric light, power and railway material at Boston since 1877, joins the list of Army-Navy "E" awards for intensive production of munitions components and other war necessities. The company was founded by a Norwegian sailor having $300 capital and a small lathe.

Niagara Hudson Cited in Commission Order

SEC seeks corporate simplification in proceedings to open on October 1 — Exemption claim ends in thirty days — Other subsidiaries involved

Corporate simplification proceedings under the "death sentence" clause of the Public Utility Holding Company Act have been ordered against the Niagara Hudson Power Corp. and its subsidiary companies by the Securities and Exchange Commission. Hearings will be started on October 1, the commission ordered, with the company having until September 15 to reply to the order and other persons and parties having until September 25 to file requests to intervene.

At the same time the commission issued other orders directing the termination of the exemption of Niagara Hudson and of its subsidiary holding company, the Buffalo, Niagara & Eastern Power Corp., from provisions of the Holding Company Act in thirty days. The order was dated August 28.

Voting Power an Issue

Hearings will attempt to determine, among other things, whether the voting power is fairly and equitably distributed among the security holders of the corporation, which is a sub-holding company of the United Corporation, with a corporate capitalization, including surplus, of $175,199,920 and a consolidated capitalization, including surplus, of $557,564,244, both figures as of December 31, 1941.

It shall also be determined whether the corporate structure or continued existence of the Niagara Hudson Power Corp. unduly or unnecessarily complicates the structure of the holding company system of the United Corp., or unfairly or inequitably distributes voting power among security holders of that system.

Another point to be decided will be whether the existing corporate structure of Niagara Hudson is such as not to justify more than a single class of stock, and still another will be whether it is necessary to require that Niagara Hudson take action so that it shall cease to be a holding company with respect to each subsidiary company thereof which, itself, has a subsidiary company which is a holding company.

The commission directs also that the proceedings determine whether the voting power distribution of the security holders of the Buffalo, Niagara & Eastern Power Corp. is fair and equitable, whether its continued existence unnecessarily would complicate Niagara Hudson's structure, and whether its structure is such as not to justify more than a single class of stock.

Whether the corporate structure of the Niagara Falls Power Co. should be revised, whether that company also should have to restate its several accounts and whether it should be prevented from paying any dividends on its common stock, all owned by the Buffalo, Niagara & Eastern Power Corp., also are questions to be decided.

Similar questions are raised by SEC as to certain other subsidiaries of Niagara Hudson, including one of whether an order should be issued requiring the New York Power & Light Corp. to convert $20,500,000 of open account indebtedness owed by it to Niagara Hudson into common stock or otherwise subordinate to its publicly held securities.

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Apply for New Line

The White River Valley Co-operative, Inc., Hollister, Mo., has applied to the Little Rock, Ark., district, U. S. Engineers, for approval of plans for a 6.9-kw. transmission line across Lake Taneycomo, near Forsythe, Mo., and Rockaway Beach, Mo. The work will consist of two copper cables suspended between steel towers.

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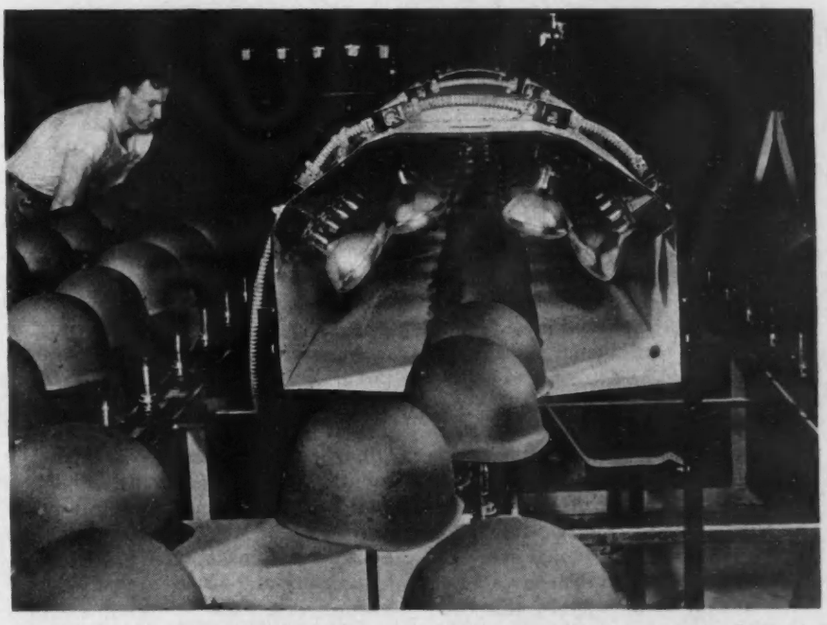
Condenser Tubings Held to 80% Level

Instructions implementing the recent WPB order restricting land surface condenser tubing to Muntz and Admiralty metal (ELECTRICAL WORLD, August 29, 1942, page 7) have been issued to the priorities staff of the power division by Deputy Chief B. J. Sickler.

The instructions direct that priorities be granted only for Muntz metal for fresh water service and for Admiralty metal for brackish or salt water service. Where complete retubing is sought the necessity for this step must be "clearly established," and then only 80 percent of the original surface (*i.e.*, number of tubes) may be allowed. Replacement tubing also is to be permitted only where it is established that 80 percent or less of the original surface is serviceable, and the number of replacement tubes permitted is to be limited to 80 percent of the surface.

"Most condensers in service today can be operated with 80 per cent (and in some cases less than 80 percent) of the originally designed surface," Mr. Sickler's instructions state.



INFRA-RED SPEEDS PAINT DRYING—Infra-red drying of freshly painted helmets for the Army has speeded drying about 1,000 percent and reduced the dryer installation cost from $2,500 down to $600, according to H. C. Guhl, Micarta development supervisor of Westinghouse. Helmets are painted while on a conveyor passing through the dryer at a speed of 12 feet per minute. Spaced 15 inches apart, the hats are dried at the rate of 500 per hour. Power consumption to operate the 112 lamps on a 110-volt line is 28 kw. The helmets are liners to be worn inside steel shells

Asks New York to Buy Staten Island Edison

Mayor LaGuardia submits plan to City Council for purchase of properties — Action by voters needed — Special election planned for January

In a special message to the City Council this week Mayor F. H. LaGuardia of New York proposed that the city of New York buy and operate the Staten Island Edison Corp., which serves the Borough of Richmond and which must be sold by order of the Securities and Exchange Commission.

Properties of the Staten Island utility, a subsidiary of the Associated Gas & Electric Corp., the Mayor estimated, could be acquired for between $14,000,000 and $16,500,000. Explaining the background of the proposal, he said the SEC had recently ordered Associated Gas to divest itself of more than 100 of its subsidiary properties and the Staten Island Edison Corp. was included.

Method of Financing

Acquisition of the properties would be a step toward the realization of Mayor LaGuardia's desire for a municipal "yardstick" power plant, his plans for which in the past have been frustrated in the State Legislature.

The Mayor's statement said in part: "In order to acquire this property it is necessary to submit the proposal in the form of a local law to the voters of the city. In the time at our disposal it was impossible to prepare a draft of such a local law containing the facts and figures required in time for it to pass and be placed on the ballot at the November 3 election. . . . However, if the Council will act on this bill at an early date, it is planned to submit the question at a special election on January 30, 1943. . . . We propose to finance this purchase through the sale at public auction of a 30-year serial issue bearing interest at not more than 3 percent. The operation would be entrusted to the Department of Public Works. The proposed local law requires the rates to be reasonable and sufficient to provide all operation and maintenance expense, interest, retirement of the bonded debt and a sum, in lieu of taxes, amounting to 12 percent of gross annual operating revenues. This is equivalent to the taxes actually paid to the city by this company in recent years. The accounting practices of such an operation are carefully prescribed by the Public Service Commission pursuant to authority vested in it by law." The Mayor said he would ask the Legislature to permit the employees of the Staten Island Edison Co. to be taken over by the city's civil service and pension system.

The Mayor's message gave the following description of Staten Island Edison: "The property consists of an electric generating plant located at Livingston, with a rated capacity of 46,000 kw., and the substations, with an aggregate rated capacity of 142,575 kva., together with 67 miles of high-tension transmission lines and 3,500 miles of distribution lines and sundry incidental plant equipment and facilities. . . "

Denis J. Driscoll, co-trustee of Associated Gas & Electric, stated that if the Council authorized acquisition of the plant and the action was ratified by the voters "we will devote every effort . . . to work out a proposal to the mutual advantage of the city, the security holders of such corporations (subsidiaries) and the estate of which we are trustees." He made it clear, however, that no terms had been agreed upon and that the transaction could be put through only after "careful consideration" by the trustees, the security holders, the directors of subsidiaries and the court.

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Utility Won't Appeal "Death Sentence"

The management of Electric Power & Light Corp., major sub-holding unit in the Electric Bond & Share system, will not appeal the SEC ruling issued on August 22 (ELECTRICAL WORLD, August 29) requiring dissolution of the company, Joe H. Gill, president, said in a letter to stockholders recently. It is considered probable that American Power & Light, second Bond & Share unit named in the "death sentence" proceedings of the commission, will follow suit. Appeals from commission rulings, on both the geographic integration and the corporate simplification provisions of the Holding Company Act, are pending before the courts.

Directors of Electric Power & Light, meeting last week following the SEC dissolution order, took no action on dividends on its preferred stocks, normally up for declaration at this time. The utility had been making partial payments against arrears, the last disbursement having been made on July 1 at the rates of 35 cents a share on the $7 preferred and 30 cents on the $6 preferred. Earnings were more than adequate to meet the partial payments, the company said, but action was deferred following the SEC order.

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Wilder Hydro Sought by Bellows Falls

The Wilder hydro-electric station of the Olcott Falls Co., near White River Junction, Vt., on the Connecticut River, is to be acquired by the Bellows Falls (Vt.) Hydro-Electric Corp., a New England Power Association subsidiary, if governmental approval is received. The plant has an installed capacity of about 5,000 kw. and includes a 635-ft. concrete dam extending between Hartford, Vt., and Lebanon, N. H., a canal, five horizontal waterwheel generators, transformers and two transmission lines of 13 and 33 kv. rating.

For several years the entire output of the plant has been sold to the Bellows Falls company and Granite State Electric Co. The Olcott Falls Company's properties were engaged in pulp and paper manufacture prior to the demolition of the mills and making of the power contract with the local utility system. The contract has five more years to run. Coincident with applications to the Vermont and New Hampshire commissions, the Federal Power and Securities & Exchange commissions for approval of the sale, the FPC has been asked to approve a joint application for a license for Wilder. The consideration named in the transaction is $200,000.

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Utility Steel Extensions Limited to 2,000 Feet

WPB's power division has put into effect two modifications of previous policies regarding utility extensions.

Priorities for extensions using steel wire in excess of 2,000 feet, where the extension averages less than 2,000 feet per customer and is for houses wired prior to March 26, 1942, will no longer be granted. No extension with an overall length in excess of 2,000 feet now is now permitted, regardless of the type of conductor or the number of customers involved.

The other change permits issuance of an A-1-j rating for No. 8 conductor because excess stocks of this material in utility stores is virtually exhausted. The A-1-j rating is not high enough to enable purchase of wire from wire mills, but it is sufficient to obtain it from warehouses, which still have some stocks.

PRIORITY AND PRICE SHORTS

OPA HAS ISSUED A DIGEST covering the principal points of Maximum Price Regulation 136 (Machines and Parts and Machinery Services) as it applies to suppliers of machinery services for the guidance of those performing such services and their customers. The release outlines what services are covered, what reports and records are required, gives illustrations of how to compute prices. Copies may be obtained at regional offices; ask for Release OPA-T-66.

RUBBER IN ALL FORMS, including scrap and reclaim, is now under complete allocation, replacing the previous Order M-15-b schedules which specified the percentage of consumption permitted for various commodities. It is stated at WPB that the procedure of the past will be continued internally on a month-to-month basis, with manufacturers notified regularly what amount of rubber can be used for different products. In other words, instead of having set schedules such as M-15-b, the schedules now will be compiled within WPB and rubber allocated to users with instructions as to what use is to be made of the supply. WPB states that no fundamental changes are anticipated in basic articles which have been allowed rubber in the past.

OPA HAS RULED that retail servicemen engaged in the installation, adjustment, repair or overhauling of nonportable household appliances (refrigerators, ranges, ventilating fans, electric washing machines, oil burners, etc.) are entitled to extra gasoline rations for a passenger car used in this work. Authority for this comes under Section 506(1) of the Gasoline Rationing Regulations. Servicemen must show that they cannot form a car pool or use alternate transportation, but they are entitled to extra mileage, even though driving up to 470 miles monthly is not eligible for extra coupon consideration —470 miles monthly is the amount of "pleasure" driving allowed a "B" or "C" book holder. Local boards have authority to decide individual cases, but appeal is possible to the state director.

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Fluorescent Fixture Order Extended by WPB

WPB this week extended the fluorescent fixture order, which expired September 1, for another month to permit completion of a general revision of the order.

GOING TECHNICAL—Office workers of General Electric at Boston step up their wartime efficiency by studying principles of electrical apparatus under tutelage of staff engineers. R. J. Greene, Jr., fractional-horsepower motor specialist, is shown dispensing the technical curricula

The revised order is expected to contain the long-anticipated prohibition of the use of steel in manufacturing fixtures, as well as continue, with perhaps some modifications, the existing restrictions generally limiting manufacture and sale of fixtures for war uses.

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San Antonio Bonds Placed on Market

Public offering of a new issue of $33,950,000 electric and gas revenue bonds of the city of San Antonio, Tex., was made this week, with coupon rates of 2½, 2¾ and 3 percent, due serially on August 1, 1944 to 1972.

The financing is to effect the purchase by the city of the electric generating and transmission facilities, electric and gas distribution system and certain other facilities in and around the community, now owned by San Antonio Public Service Co., a subsidiary of American Light & Traction Co.

Upon completion of the financing, the city of San Antonio will own and operate the properties, which are to be mortgaged under the indenture under which these San Antonio Electric and Gas revenue bonds are issued. The bonds will be part of an issue of $35,000,000 bonds authorized under the indenture and will be special obligations of the city payable from the net revenues derived from the operations of the electric system and gas distribution system of the city.

C. A. Winder Assigned to WPB Power Group

C. A. Winder, for the last seven years chief of co-operatives operations of the Rural Electrification Administration, has been appointed a priorities consultant with the WPB power division and is expected, ultimately, to succeed B. J. Sickler as chief of the division's priorities section. Mr. Sickler recently was made deputy chief of the division.

Mr. Winder began his career with the General Electric Co., serving that concern in various engineering and executive capacities from 1909 to 1924. After brief connections with Southern Equipment Co. as manager of the electrical division and with the Connecticut Electric Co., he was for four years, 1926-30, supervisor of public utilities for the city of Fort Worth, Tex. From 1930 until he joined REA in 1935 Mr. Winder maintained his own office as consulting engineer. During one year while with REA he was loaned to the Michigan Public Utilities Commission.

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Four Franchises Granted

Authorization for the Louisville Gas & Electric Co. to apply franchises in four newly incorporated Jefferson County (Ky.) communities—Indiana Hills, Mockingbird Valley, Parkway Village and Seneca Gardens—was granted by the Public Service Commission recently.

Issues Show-Cause Order on Hydros

South Carolina Electric & Gas Co., Columbia, S. C., has been ordered by the Federal Power Commission to show cause, on or before September 15, either (1) why it should not apply for and secure from the commission authority under the Federal Power Act for the continued operation of its Parr Shoals and Columbia hydro-electric plants, or (2) why the commission should not "forthwith enter such order or orders as it may find appropriate, expedient and in the public interest to develop, conserve and utilize the navigation and water-power resources of the region, and to conserve and protect the interests of the United States" with respect to the two power developments.

According to the order, the continued operation and maintenance of the two projects without federal authority is in violation of the Federal Power Act and that, although the commission has repeatedly requested the company to file appropriate applications for federal license for the two developments and conferences have been held at which representatives of the company promised prompt action, the company has failed to file an appropriate application for either project up to the present time.

The Parr Shoals plant, situated on the Broad River about 28.5 miles upstream from the confluence of the Broad and the Saluda rivers in South Carolina, has an installed capacity of 14,880 kw., and the Columbia plant, situated on the Columbia Canal at Columbia, S. C., has an installed capacity of 9,750 kw.

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Residential Charges Listed by FPC

Electric rates for residential customers in the New England states as of January 1, 1942, are shown in a report just issued by the Federal Power Commission, which presents, in the form of typical net monthly bills, residential rates in all communities of 250 or more population.

The report was the first of a series of nine, one for each of the standard geographic divisions of the country, and covers typical bills for 15, 25, 40, 100, 250 and 500 kw.-hr. of residential service in the communities covered, which are listed alphabetically within each state. Residential bills are shown in the main table of the report for 1,483 New England communities served by 201 utilities. Of these communities, 121, or 8.2 percent, are served by 75 publicly owned utilities.

The report on the Middle Atlantic states followed shortly after the New England report was issued. It listed 4,000 communities in the states of New Jersey, New York and Pennsylvania, served by 224 utilities. Of these communities, 114, or 2.9 percent, are served by 103 publicly owned utilities.

MEETINGS

Previously Listed

American Institute of Electrical Engineers—Pacific Coast convention, Hotel Vancouver, Vancouver, B. C., September 9-11. H. H. Henline, National secretary, 33 West 39th St., New York, N. Y.

Pennsylvania Electric Association—Annual meeting Bellevue-Stratford Hotel, Philadelphia, Pa., September 11. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

Municipal Electric Utilities Association of New York State—Annual conference, Lake Placid, N. Y., September 16-18. H. E. Pearsall, secretary, 17 Whaley St., Freeport, N. Y.

International Association of Electrical Leagues—Annual conference, Hotel Cleveland, Cleveland, Ohio, September 17-19. O. C. Small, secretary, 155 East 44th St., New York, N. Y.

International Association of Electrical Inspectors—Northwestern Section, Portland Hotel, Portland, Ore., September 17-18. F. D. Weber, secretary, P. O. Box 70, Portland, Ore., Southwestern Section, Fresno, Calif., September 21-23, H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif., Western Section, Book-Cadillac Hotel, Detroit, Mich., October 5-7, F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Taft Hotel, New Haven, Conn., October 12-14, F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern Section, John Marshall Hotel, Richmond, Va., October 19-21. C. M. Jones, secretary, 307 Trust Company of Georgia Bldg., Atlanta, Ga.

Illuminating Engineering Society—Annual convention, Hotel Jefferson, St. Louis, Mo., September 21-22. Frank G. Horton, executive secretary, 51 Madison Ave., New York, N. Y.

Association of Iron and Steel Engineers—Technical conference, William Penn Hotel, Pittsburgh, Pa., September 22-24. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Indiana Electric Association — Business meeting, Indiana War Memorial Bldg., Indianapolis, Ind., September 24-25. R. E. Blossom, secretary, 1414 Circle Tower, Indianapolis, Ind.

Southeastern Electric Exchange—Engineering and Operating Section, fall conference, Henry Grady Hotel, Atlanta, Ga., September 24-25, John W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta, Ga.

International Municipal Signal Association—Annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., October 4-7. Irvin Schulsinger, secretary, 8 East 41st St., New York, N. Y.

Electrochemical Society — Fall meeting, Hotel Statler, Detroit, Mich., October 7-10. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York, N. Y.

Kansas Association of Municipal Utilities—Annual convention, Porter Hotel, Beloit, Kans., October 12-13. L. C. Angevine, secretary, City Hall, McPherson, Kans.

American Society of Mechanical Engineers—Fall meeting, Hotel Sagamore, Rochester, N. Y., October 12-14. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

American Welding Society—Annual meeting, Hotel Cleveland, Cleveland, Ohio, October 12-15, Miss M. M. Kelly, secretary, 29 West 39th St., New York, N. Y.

Pacific Coast Electrical Association—Business Development and Administrative Services Sections, Californian Hotel, Fresno, Calif., October 22-23.

National Electrical Manufacturers Association — Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., October 26-30. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

National Safety Council—Annual congress, Sherman Hotel, Chicago, Ill., October 27-29. N. H. Dearborn, managing director, 20 N. Wacker Drive, Chicago, Ill.

Birmingham Utility Purchase Rejected

Jefferson County, in which Birmingham, Ala., is located, by a two to one vote on August 27 declined to take any step toward the purchase of the Birmingham Electric Co., a subsidiary of National Power & Light Co., which has been ordered by SEC to divest itself of its properties in compliance with the "death sentence" provisions of the Holding Company Act. The City Commission of Birmingham took similar action a few weeks ago.

In the meantime National Power & Light has asked the Securities and Exchange Commission for a year's extension of its order directing dissolution of National Power & Light.

The city of Bessemer, which is served in part by Birmingham Electric, wants to buy the property provided Birmingham or Jefferson County does not. This city also has a municipal distribution system served by TVA. Commonwealth & Southern Corp. has also made a bid for the company.

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Sets November for Trial of Cable Companies

As a compromise between the requests of government representatives and defense counsel, Federal Judge Thomas Meaney has set November 9 as the trial date for nine companies on charges of conspiracy to defraud the government in the sale of insulated cable to the Navy.

Defense counsel asked that the trial be delayed until after January 1 because of war production needs. Samuel S. Isseks, special assistant to Attorney-General Francis Biddle, wanted a date in October.

Judge Meaney predicted that war production needs would become more and not less intense as time goes on, but said that the defendants are entitled to time for adequate preparations of their case.

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Northwest Aluminum Plant Gets Power

The Pacific Northwest's fifth aluminum reduction plant began operations August 20, when the Bonneville power administration inaugurated electric service. Actual production of metal was scheduled to start within ten days of the opening, Dr. Paul Raver, Bonneville administrator said. Approximately 40,000 kw. of Bonneville power will be required when the plant is in capacity production.

Slight Drop Comes in Weekly Output

After two weeks of greater than seasonal rise in weekly figures of electrical energy distributed by the light and power utilities, the trend of the curve turns downward for the week ending August 29. Data from the Edison Electric Institute show 3,640,000 kw.-hrs. as against 3,674,000 kw.-hrs. and 3,655,000 kw.-hr. for the two weeks immediately previous. The gain for the week of August 29 over the corresponding week of 1941 is 11.6 percent.

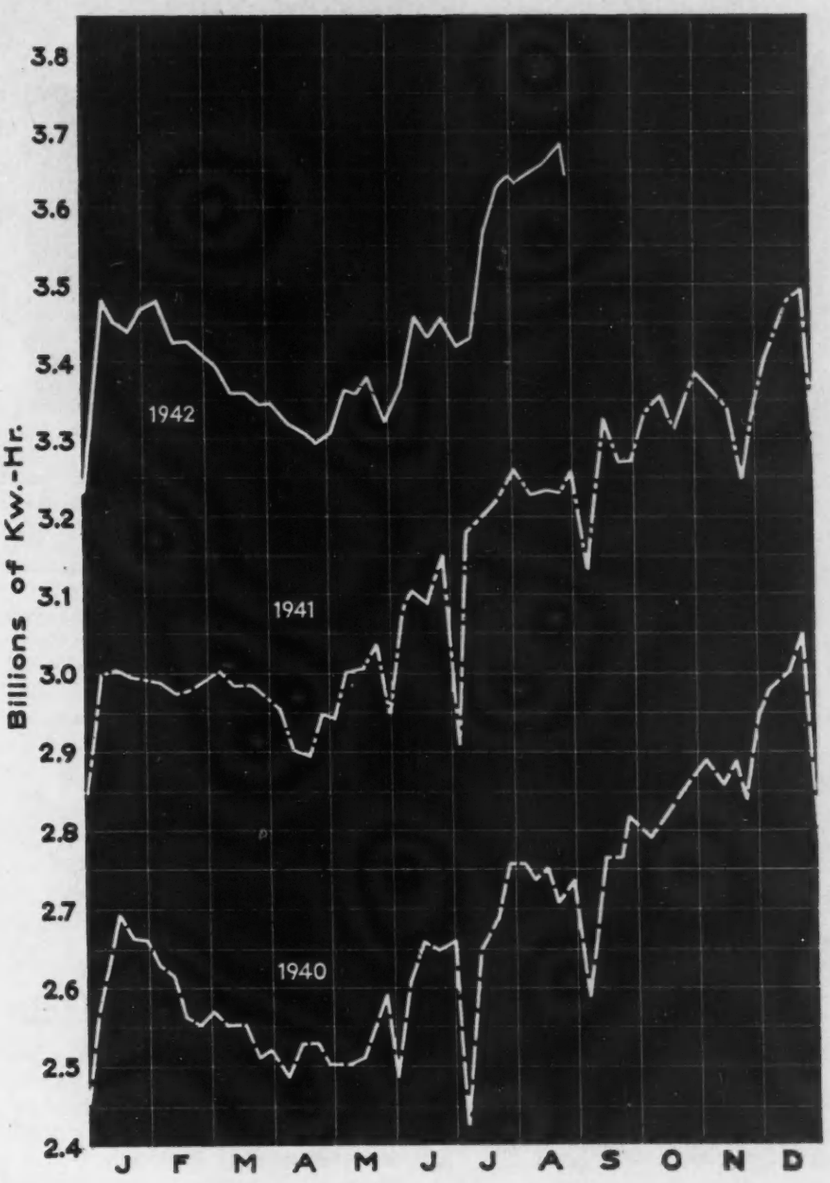
The decline in rate of increase is common to all regions of the country except New England which registered no change. The most considerable drop occurred in the Middle Atlantic states where the rate of increase slowed to about one half.

Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
Aug. 29	3,640	Aug. 30	3,261	Aug. 31	2,736
Aug. 22	3,674	Aug. 26	3,231	Aug. 24	2,714
Aug. 8	3,637	Aug. 9	3,323	Aug. 10	2,743
Aug. 1	3,649	Aug. 2	3,263	Aug. 3	2,767
July 25	3,626	July 26	3,220	July 27	2,761
July 18	3,565	July 19	3,199	July 20	2,681
July 11	3,429	July 12	3,178	July 13	2,657
July 4	3,424	July 5	2,904	July 6	2,425
June 27	3,457	June 28	3,157	June 29	2,660

Percent Change from Previous Year

	Week Ending		
	Aug. 29	Aug. 22	Aug. 15
New England	+ 6.2	+ 6.2	+ 6.2
Mid-Atlantic	+ 5.9	+10.9	+ 9.7
Central Industrial	+ 8.8	+ 9.4	+ 7.3
West Central	+10.4	+ 8.7	+ 4.3
Southern States	+15.6	+19.0	+21.9
Rocky Mountain	+ 8.1	+ 8.9	+ 8.3
Pacific Coast	+29.8	+27.1	+25.5
Total United States	+11.6	+13.7	+12.9



Energy Sales Rise 11.7% in June

Sales of electric energy to ultimate consumers in June totaled 12,669,868,000 kw.-hr., compared with 11,345,820,000 kw.-hr. in June, 1941, an increase of 11.7 percent, according to the report issued by the Edison Electric Institute.

Water power plants generated 5,352,320,000 kw.-hr. in June, compared with 4,056,900,000 kw.-hr. in June, 1941, an increase of 31.9 percent.

Revenue from ultimate customers amounted to $227,056,600, compared with $214,329,100 in June, 1941, an increase of 5.9 percent.

Average annual use for the twelve months ended June 30 advanced to 1,009 kw.-hr. per customer from 968 kw.-hr. per customer for the twelve months ended June, 1941. The average annual bill rose 1.5 percent, from $36.69 for the twelve months ended June, 1941, to $37.23 for the twelve months ended June, 1942. Revenue per kilowatt-hour for the twelve months ended June dropped 2.6 percent, to 3.69 cents from 3.79 cents for the twelve months ended June, 1941.

Classification of Sales, June, 1942 and Change from 1941

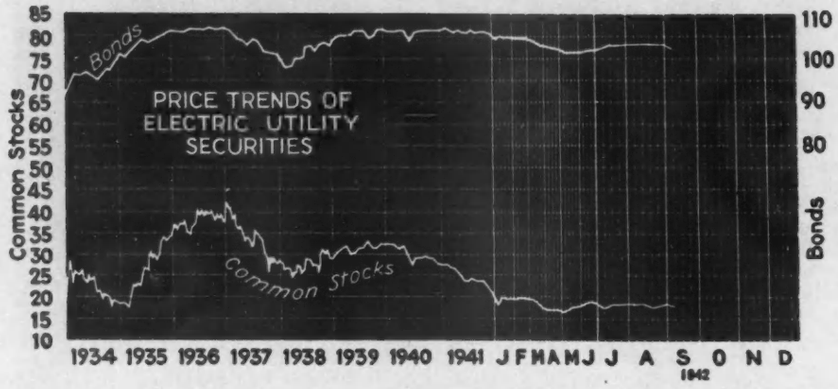
Kilowatt-hour Sales—During month of June	Million Kw.-Hr. 1942	1941	% Change
Residential or domestic	2,025	1,909	+ 6.1
Rural (Distinct rural rates)	270	231	+17.0
Commercial or industrial			
Small light & power	2,160	1,980	+ 4.1*
Large light & power	7,205	6,346	+15.3*
Street & highway lighting	132	138	— 4.6
Other public authorities	302	240	+26.1
Railways and railroads			
Street & interurban	325	297	+ 9.4
Electrified steam	184	164	+11.8
Interdepartmental	66	40	+65.2
Total to ult. customers	12,670	11,346	+11.7

* Based on changes made in same classifications both years.

Reports on P-46 Survey

Answers to 49 questions regarding P-46, as given by Walker L. Cisler of the Power Branch, WPB, are contained in a recent bulletin sent out by the utilities group, National Association of Purchasing Agents. This group, which is headed by Fred A. Compton of Detroit, is periodically distributing such compilation of interpretations to its members.

Utility Stocks Decline; Bonds Also Drop



Prices of electric light and power securities lost ground during the past week. "Electrical World" stock index dropped to 17.7 from 18.0 the previous week; last year, 23.6. Bonds dropped to 103.0 from 103.2 the previous week; last year, 105.8.

SEC Approves Potomac Financing

The SEC has approved a plan of the Potomac Electric Power Co. to issue and sell $5,000,000 of first mortgage bonds, 3¼ percent, due 1977. The commission conditioned its approval on Potomac Electric notifying the SEC 30 days before it declares any cash dividend on its common stock.

Proceeds from the sale of the bonds, which will be sold publicly, are to be used primarily to increase the company's generating capacity and for additions to plant and equipment. The proceeds will be sufficient to complete only the 1942 expansion program, the company stated, and the 1943 program of construction will require the issuance of additional capital stock.

Potomac Electric Power is a direct subsidiary of Washington Railway & Electric Co. and an indirect subsidiary of North American.

•

Southwestern Amends Financing Plan

Southwestern Public Service Co. has filed with the SEC an amendment to its registration statement altering somewhat the nature of its financing which is scheduled to be offered on September 15 by an underwriting group of 80 to 85 investment houses headed by Dillon, Read & Co.

The original $18,500,000 of 3¾ percent 30-year bonds has been increased to $20,000,000; the $5,500,000 of notes has been increased to $6,000,000. The proposed $8,500,000 of 6½ percent preferred stock has been reduced to $6,000,000 and 185,000 shares of common stock have been added.

The financing is one of the last steps in bringing the Community Power & Light Co. system into line with the provisions of the public utility holding company act of 1935. The Southwestern company is controlled by General Public Utilities, Inc., which in turn is controlled by Community Power & Light. Stockholders of the two parent companies have approved a merger of the holding units into Southwestern.

•

Year's Stay Given United Light

The SEC has granted a year's extension, to August 5, 1943, to United Light & Power Co. and subsidiary companies to comply with the commission's order requiring them to dispose of their interests in designated companies. (ELECTRICAL WORLD, August 1, page 7).

The commission noted that substantial progress had been made by the companies in complying with the original order of August 5, 1941, and that a year's extension "is necessary and appropriate in the public interest and for the protection of investors."

United Light & Power filed a voluntary plan for dissolution last July, and hearings have been concluded on the plan which provides for the distribution of United Light & Power Railways common stock held by United Power among the latter's stockholders.

•

SEC Orders Hearing on General Gas Plan

Securities and Exchange Commission has ordered a reconvening on September 17 of the consolidated hearings on the corporate simplification and voluntary plan of recapitalization of General Gas & Electric Corp., a subsidiary of Associated Gas & Electric Corp.

The company's plan of recapitalization includes proposals to reclassify its present prior preferred stock, cumulative preferred, and class A common stock.

FINANCIAL BRIEFS

AT THE REQUEST of the Tennessee Railroad and Public Utility Commission, the SEC has postponed from September 1 to September 16 its scheduled hearings on the application of Tri-City Utilities Co., a wholly owned subsidiary of Associated Electric Co., with respect to its reduction of capital stock from time to time through purchase and retirement of its common stock at par value, to the extent of funds which become available from the sale of properties or other assets.

MIDLAND UNITED CO. has proposed to SEC the sale of its subsidiary, the Midland Stock Transfer Co., to three other subsidiaries. The proposed purchasers are the North Indiana Public Service Co., Indiana Service Corp. and the Chicago, South Shore & South Bend Railroad. They will pay $3,450 cash plus an amount equal to 6 percent on $5,000 from December 31, 1941, to the date of the sale consummation, for the outstanding 1,000 shares of common capital stock which has a stated value of $5,000. SEC set September 13 for a hearing on various steps in the transaction.

NEW FINANCING IN AUGUST was virtually at a standstill, with public offerings of new bond issues the smallest for any month since January, 1939. There were no stock flotations for the first time since June, 1935.

HEARING SCHEDULED FOR SEPTEMBER 2 on the proposed acquisition by Illinois Iowa Power Co. of the preferred stock of Kewanee Public Service Co. has been postponed by SEC to September 23.

Utility Reports

	Net Income	
	1942	1941
*Alabama Power	$3,346,479	$3,147,117
*Birmingham Electric	1,012,408	725,475
*Commonwealth & Southern and subs.	10,945,236	11,588,426
*Consumers Power	8,384,441	9,786,942
*Dallas Power & Lt.	1,507,495	2,170,006
*Florida Pwr. & Lt.	1,401,318	2,701,748
*Georgia Power	5,459,504	5,120,788
*Kansas Gas & Elec.	1,233,831	1,619,530
*Louisiana Pwr. & Lt.	992,547	1,078,690
*Minnesota Pwr. & Lt.	1,425,544	1,518,969
*New Orleans Pub. Serv.	2,219,959	2,573,899
*Ohio Edison	3,408,982	3,859,137
*Texas Power & Lt.	1,402,251	1,994,405

*Twelve months ended July 31.

HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

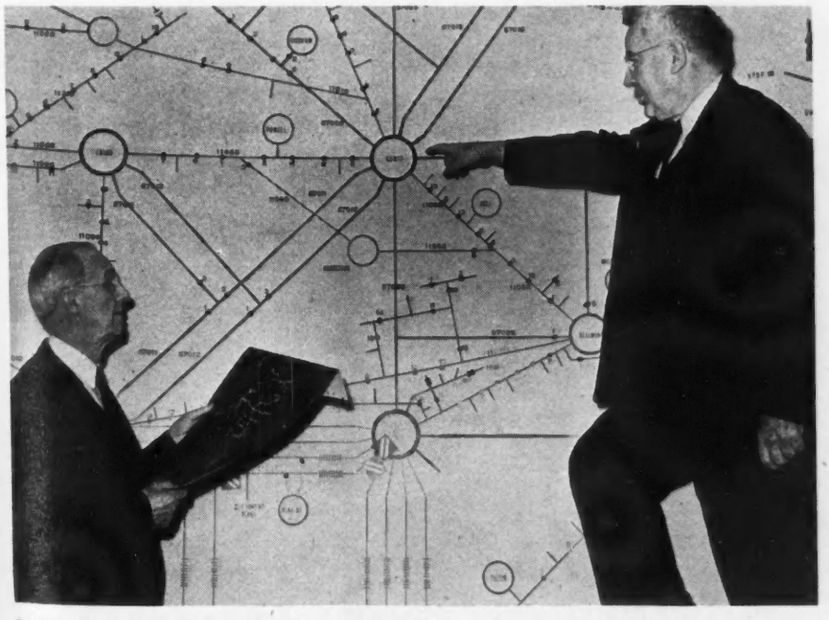
Easy-to-Follow Load Dispatcher's Board

In laying out a load dispatcher's board recently installed by the Portland (Ore.) General Electric Company two features were embodied which facilitate the dispatcher's work by making the chart quickly and easily followed by the eye.

First, there has been left out of the drawing all of the switching detail within the plant, each plant and substation being indicated merely by a circle with the name. Said W. C. Foster, load dispatcher: "What we are operating is a system as a whole, not any plant or plants. Putting in a lot of detail concerning each plant would confuse the drawing and make it more difficult for the eye to take in the whole thing almost at a glance, which is what we want. All this detail information concerning the switching facilities within the plant is already carried on charts in binders, indexed and quickly available should the necessity arise when we needed this information."

He also pointed out that all lines were run with as few turns as possible, reducing right-angle turns, L turns and crossing lines to a minimum. "The eye can make a whole lot better time with less strain on a nice, straight road with easy curves with as few obstructions and stop signals as possible," he said. "In short, we laid out the board not as a draftsman would do it, to include as much information per square foot as he could crowd in, but as the dispatcher would find it most convenient to use."

The board is 9 x 22 ft. on a curve of about 15 ft. radius—plywood and flooring base with linoleum covering.



LOAD DISPATCHER'S BOARD is simpified by leaving out switching details of plants and substations

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Charging Locates Open Cable Faults

By FRANK E. REEVES

Test and Research Section, Technical Research Department, Boston Edison Company

Frequency of open circuit faults in multi-conductor cables, the relative simplicity of location measurements of such faults and infrequent use of such measurements seems to warrant a short discussion of the method of finding where this type of cable trouble is situated.*

Conductors are burned off either due to short-circuit currents of very high magnitude, to high reactance in the fault circuit which prevents currents in relays from reaching their maximum saturation timing or to the re-energizing of faulted cables after being cleared by relay action. Re-energizing is often necessary immediately after failures occur in order to sectionalize radial or ring transmission systems to permit restoration of substations.

Possibilities offered by a comparison of a.c. charging currents in a faulted cable seem to have been neglected. If the necessary instruments were always readily available, such tests could be adopted as standard procedure for fault analysis before starting other work. Unless the fault is well carbonized or is exposed to

*See also "Use Capacitance Discharge to Locate Cable Faults," by W. D. Seal, "Electrical World," March 21, 1942, page 1006 (Eds.).

salt water, an accurate comparison of charging currents should indicate:

1. Whether an open circuit condition exists. (Similar currents on all conductors would indicate that all conductors are continuous.)
2. The distance to the fault if any conductor is open. (The ratio of the lower value to the higher values multiplied by 100 is the percentage distance to the open. Impressed voltages must be equal.)
3. If the fault is carbonized or exposed to salt water, the measurements will indicate which conductors are involved.

An analysis of the reading should be made before drawing conclusions. If the leakage on one conductor is higher than that on the two others it is probable that the high-leakage conductor is faulty and may or may not be continuous. If two conductors indicate exactly double the current of the third conductor, this would indicate that a well-carbonized fault exists between the two conductors.

Charging Current Corrections

Since the charging current is directly proportional to the voltage impressed, a correction must be made if the voltage producing the charging current on the continuous phase is different from that producing the charging current on the open phase. Such a condition might exist on a long-shielded cable if the open were near the sending end. In such cases the current on the continuous conductor might be several times that of the open conductor, and the change in current might affect the supply voltage.

If V_1 is the voltage on the continuous conductor, V_2 that on the open conductor, I_1 the current on the continuous conductor and I_2 that in the open conductor, with I'_2 the current in the open conductor corrected for the difference in voltages, then

$$I'_2 = I_2 \frac{V_1}{V_2}$$

The percentage distance to the fault would be $\frac{I'_2}{I_1} \times 100$

If $V_1 = V_2$, as is usual, then I'_2 will equal I_2 and the percentage distance to the fault will be

$$\left(\frac{I_2}{I_1} \times 100\right)$$

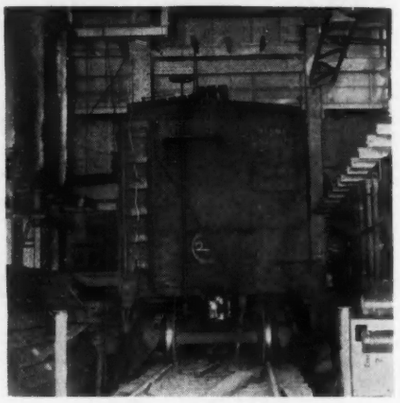
In order that a successful measurement of an open may be obtained by this method, it is essential that no current pass through the fault. The measurements, therefore, should be made at as low a voltage as practicable, depending, of course, upon the range and accuracy of the a.c. milliammeter available.

In most substations a source of 115-volt a.c. is generally available for relay and meter testing. It would be advisable to make the tests at this or a lower voltage if a voltage varying device is available (such as a variac). If satisfactory deflections are not obtained at 115 volts, higher voltages in progressive steps should be tried. Readings should be taken after each increase in voltage so that, should fault current start to flow, at least an approximate comparison of charging currents will have been obtained.

During the past year successful measurements were made of open circuits on two cables, one 5 miles and the other 11 miles long. On the 5-mile cable the measurement located the trouble within a few feet of the faulted joint, while in the 11-mile cable the error did not exceed 300 ft.

Although the scale ranges of the current-measuring devices depend somewhat on the lengths of cables on the particular system involved, an a.c. milliammeter with a range of 0-200 and an ammeter with 0-1 and 0-2 amp. have been found satisfactory for the measurements made on the Boston Edison system.

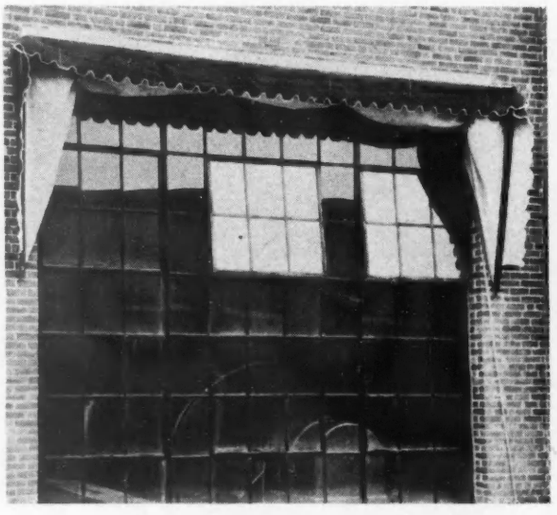
Box Car in Boiler Furnace



Considerable time and effort was saved recently in erection of the new boiler for the new 80,000-kw. No. 2 unit at Port Washington station of the Wisconsin Electric Power Company by building a temporary railroad track into the partly finished boiler house so drums, tubes, firebrick and other material could be unloaded at the point of installation. The furnace was literally built up around the track, as shown, before it was removed and the furnace inclosed.

Removable Window Instead of Big Door

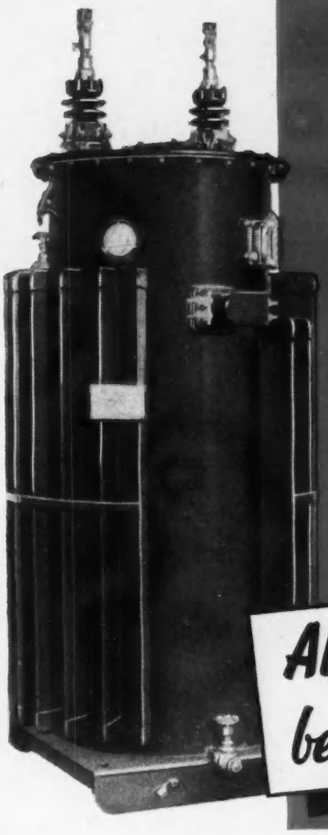
To facilitate handling heavy machinery at the steam plant of the Braintree (Mass.) municipal lighting department without the use of a door in the wall of a room housing a new 7,500-kw. turbo-generator and auxiliaries, a window opening about 15 ft. wide x 13½ ft. high was left in the wall. The window framing supports eleven vertical and seven horizontal rows of panes, and when unscrewed from the casing the window can be readily lifted and removed from its place by a 20-ton turbine room crane inside the station which was installed to serve the generating equipment. Machinery parts were brought into the plant through this wall during recent construction activities over a special runway from the street. Provision has been made for ventilation by swinging windows as indicated, with awning at the top, but normally no general opening of the wall is required, which contributes toward reduced heating inside the plant.



Here's the TRANSFORMER *that* STANDS UP BEST *under*

Voltage Surges
Emergency Overloads
Dust and Dirt

Because it's a liquid-filled transformer . . .



333-kva Pyranol* transformer, rated 60 cycles, 2400/4160 Y volts to 240/480 volts

AND it's free of fire hazard because the liquid is PYRANOL

PYRANOL transformers have all the features that have made liquid-cooled transformers the most nearly trouble-free electric apparatus in service today. For example:

They have high dielectric strength both at normal frequencies and impulse—an important safeguard against damage to the transformers from voltage surges caused by switching operations or by lightning. Immersion of the transformer interior in the Pyranol prevents drying and cracking of the winding insulation, a feature vital to maintenance of the high dielectric strength originally built into the transformer.

The heat-storage capacity inherent in liquid-filled transformers makes Pyranol units ideal for emergency overloads.

The pressure-tight tank protects vital parts of the transformers against damage from moisture, dust, dirt, and sabotage.

Additional Benefits

1. Saving in Copper. Secondary conductors (480 volts) require about 15 times as much copper as equivalent lengths of 4160-volt primary conductors. In a typical, large industrial plant, installation of Pyranol transformers indoors at load centers can save 50 per cent or more on copper—30,000 pounds or more.

2. Saving in Installation Cost. Because Pyranol made possible a vaultless installation of several small transformers indoors (instead of one large transformer outdoors), it brought over-all savings of approximately 20 per cent in the installed cost of a plant distribution system.

3. Saving in Power. Pyranol transformers at load centers reduce copper losses as much as 25 per cent.

Ask your G-E representative for complete information, or write for Bulletin GEA-2048D. *General Electric, Schenectady, N. Y.*

**Pyranol is the G-E trade name for askarel. Pyranol is noninflammable, and no Pyranol transformer has ever burned or contributed to a fire.*

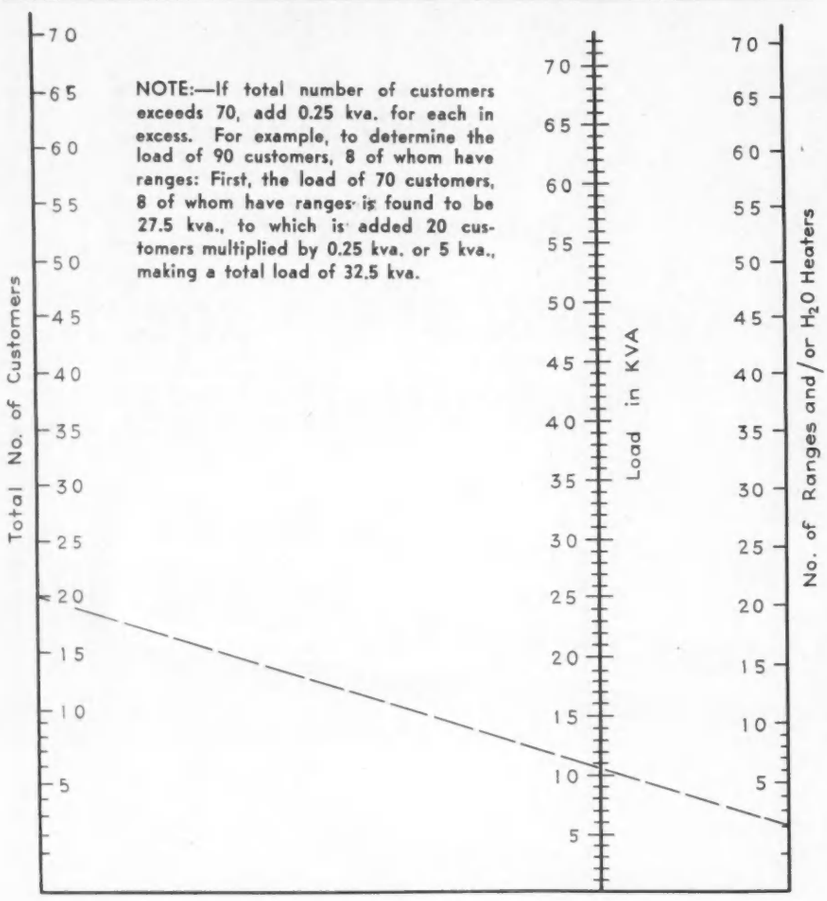
The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

GENERAL ELECTRIC

402-52-5100

HOW TO FIT

Distribution Transformers to Their Load


Total No. of Customers
70
65
60
55
50
45
40
35
30
25
20
15
10
5
NOTE:—If total number of customers exceeds 70, add 0.25 kva. for each in excess. For example, to determine the load of 90 customers, 8 of whom have ranges: First, the load of 70 customers, 8 of whom have ranges is found to be 27.5 kva., to which is added 20 customers multiplied by 0.25 kva. or 5 kva., making a total load of 32.5 kva.
Load in KVA
No. of Ranges and/or H_2O Heaters

Pole-type distribution transformers in residential areas are chosen as to proper size by an Eastern utility in accordance with the number of customers and the pro- water heaters (see nomogram). Tabulated portion of them having ranges and/or guides have been set up for installation or removal of transformers in terms of the growth characteristics of the area and the magnitude and duration of peaks.

EXAMPLE

A 5-kva. transformer in a moderate load growth area serving 20 customers of whom two have ranges (or one range and one water heater) is found to have an estimated peak load of 10.5 kva.

If duration of peak is about 40 minutes, the transformer should be replaced since the maximum load (7 kva. for 15 minutes to one hour shown on accompanying Table I) is exceeded. The new transformer should be 15 kva.

If instead of a 5-kva. transformer a 25-kva. transformer had been serving this area it should be replaced (because of underload) with a 15-kva. transformer because the load is less than 13.7 kva. (Table II.)

If a 7.5 or a 10-kva. transformer serves this load of 10.5 kva. it should remain until the load exceeds 10.5 and 14 kva. respectively before being replaced due to overload.

TABLE I—GUIDE FOR INSTALLING TRANSFORMERS

Size of Transformer to Be Installed (Kva.)	For Moderate to Rapid Load Growth Areas So 5-Minute or Longer Peak Kva. Demand Does Not Exceed:	For Slow Load Growth Areas So 5-Minute or Longer Peak Kva. Demand Does Not Exceed:	For Dormant Areas So Various Durations of Peak Kva. Demands Do Not Exceed Following Values:			
			1–5 Min. (175%)	5–15 Min. (160%)	15 Min. –1 Hr. (140%)	1–5 Hours (120%)
1.5	1.0	1.5	2.6	2.4	2.1	1.8
3	2.7	3.0	5.3	4.8	4.2	3.6
5	4.5	5.0	8.8	8.0	7.0	6.0
7.5	6.8	7.5	13.1	12.0	10.5	9.0
10	9.1	10.0	17.5	16.0	14.0	12.0
15	13.7	15.0	26.2	24.0	21.0	18.0
25	22.5	25.0	43.7	40.0	35.0	30.0
37.5	34.0	37.5	65.1	60.0	52.5	45.0
50	45.5	50.0	87.5	80.0	70.0	60.0
75	68.2	75.0	131.0	120.0	105.0	90.0
100	91.0	100.0	175.0	160.0	140.0	120.0
150	137.0	150.0	262.0	240.0	210.0	180.0
200	182.0	200.0	350.0	320.0	280.0	240.0

TABLE II—GUIDE FOR REMOVING TRANSFORMERS

Size of Transformer to Be Removed (Kva.)	For Underload if 5-Minute or Longer Peak Kva. Demand is Less Than	For Overload if Peak Kva. Demand for Various Durations Exceeds Following Values:			
		1–5 Min. (175%)	5–15 Min. (160%)	15 Min. –1 Hour (140%)	1–5 Hours (120%)
1.5	.....	2.6	2.4	2.1	1.8
3	.....	5.3	4.8	4.2	3.6
5	2.5	8.8	8.0	7.0	6.0
7.5	3.7	13.1	12.0	10.5	9.0
10	5.0	17.5	16.0	14.0	12.0
15	9.1	26.2	24.0	21.0	18.0
25	13.7	43.7	40.0	35.0	30.0
37.5	22.5	65.1	60.0	52.5	45.0
50	34.0	87.5	80.0	70.0	60.0
75	45.5	131.0	120.0	105.0	90.0
100	68.2	175.0	160.0	140.0	120.0
150	91.0	262.0	240.0	210.0	180.0
200	137.0	350.0	320.0	280.0	240.0

GAIN KW CAPACITY

the Quick, Low-cost Way and Save CRITICAL MATERIALS

ON a system where power factor is low, you can release from 0.3 to 0.6 kva of system capacity for each kva of capacitors you install. Capacitors can be obtained and installed in a matter of weeks; they require only a fraction of the critical materials you would use in the installation of new feeders or generating equipment. And the cost is only about $7.00 per kva of capacitors installed. Ask your G-E representative today for complete information and Catalog GEA-3333. *General Electric, Schenectady, N. Y.*

IMPROVE POWER FACTOR with G-E PYRANOL CAPACITORS

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

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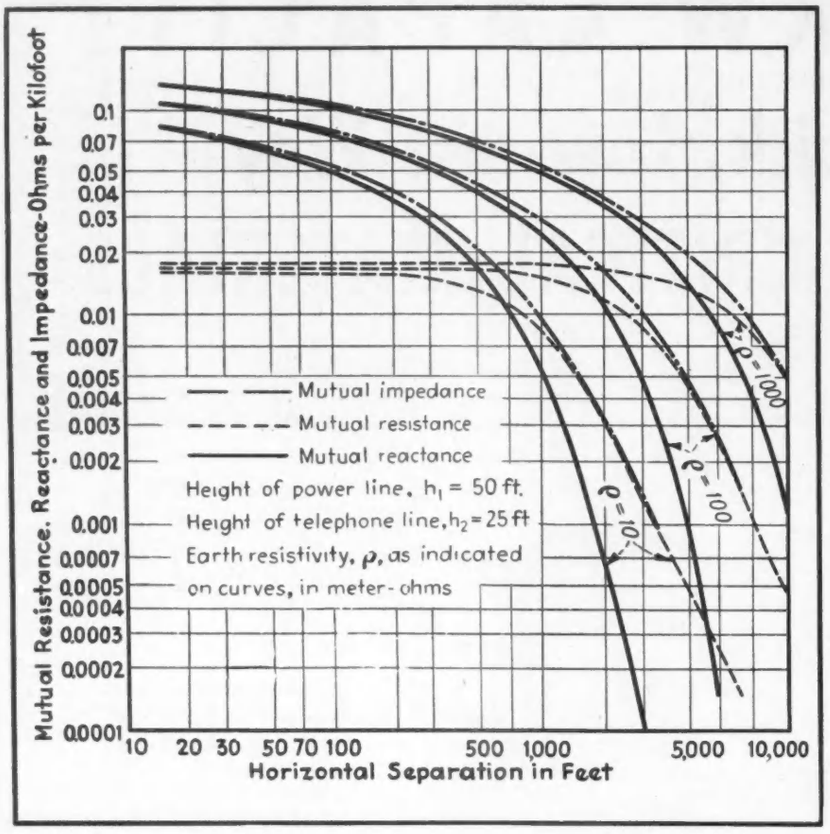

COUPLING COEFFICIENTS (60 cycles), variation of mutual impedance with separation and earth resistivity

Coupling Coefficients for Low Frequency*

By R. D. EVANS
Industry Engineering Department
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Where power and communication circuits operate in relatively close proximity, earth-return currents in the power system may produce important inductive effects in the communication circuits. The resultant induced voltages can be estimated from these currents and the low-frequency (60-cycle) coupling factors for the circuits.

Coupling factors or coefficients for earth-return circuits can be calculated on the basis of a theory developed by J. R. Carson. This method is used for determining the self-impedance of earth-return circuits and the mutual impedance between parallel circuits with earth-return, taking into account the mutual resistance and reactance terms which vary with the resistivity of the earth. It assumes uniform resistivity and the distribution of earth current that occurs in the middle of a long section.

Coefficients of mutual-resistance, reactance and impedance for various horizontal separations are shown in the accompanying curves, from a report of the joint subcommittee on development and research of the Edison Electric Institute and Bell Telephone System.

The coupling curves are plotted for 60 cycles and for three earth resistivities, 10, 100 and 1,000 meter-ohms. It will be noticed that for close separations effect of earth resistivity is not very important, but at separations of about a mile the difference is of considerable magnitude since the ratio of the induced voltages is about 40:1 for variation in the resistivity from 10 to 1,000 meter-ohms.

In order to use the curves earth resistivity for the particular location may be used, or earth resistivity can work, the value of 100 meter-ohms may be used, or earth resistivity can be approximated on the basis of other measurements made in the vicinity if geological conditions are similar. When reasonably accurate results are required, particularly for long parallels at wide separations, coupling tests are practically always required.

*Excerpt from advance pages of "Electrical Transmission and Distribution Reference Book," published by Westinghouse Electric & Manufacturing Company.

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Induction Regulators Given Seasonal Ratings

Extensive tests of various types and vintages of 2.3-kv. induction regulators by a Middle Atlantic utility indicates that operators should be supplied with a schedule of permissible loading for different months of the year. Some regulators could be rated up to 150 percent of nameplate rating in winter and if ventilation conditions were favorable; other types have to be held to partial loading in summer even under favorable indoor conditions of ventilation. In short, no single value of seasonal rating is feasible for all types under varying conditions of heat dissipation.

The tests were made to determine temperature rise above laboratory ambient and seasonal temperatures were increased by these test rises to determine permissible loading to result in 95 C. for average copper temperature, 80 C. for top oil temperature at 94 percent power factor. January observations at typical substations showed warrant for adopting ambient temperature values of 10 C. for outdoor in-

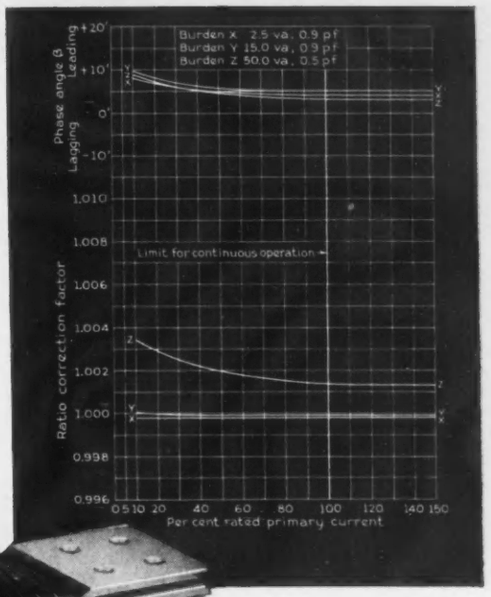
Table I—2,300-Volt Induction Regulator, 46 Kva., 200 Amp.

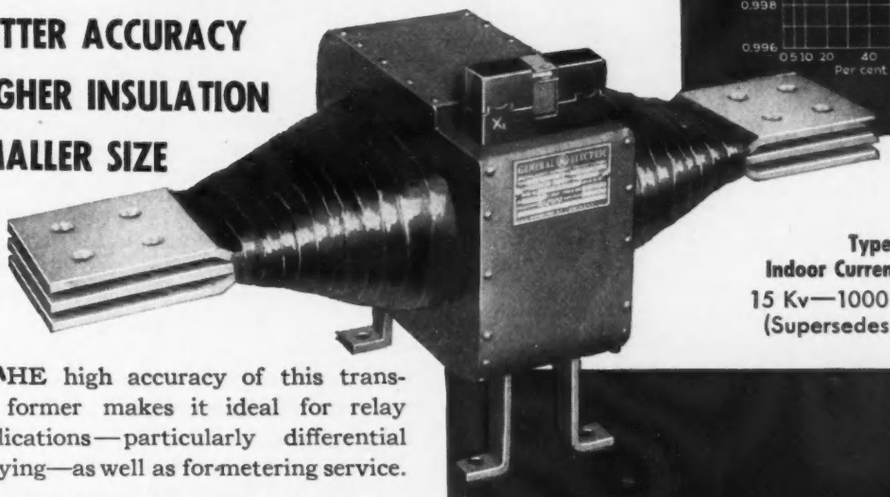
95 deg. C. Average Cu. Limit; 75 deg. C. Top Oil Limit; 94% Power Factor
Ventilation: P = Poor; G = Good; O = Outdoor

Month	Ambient			Top Oil °C.			% Rating			Amperes		
	P	G	O	P	G	O	P	G	O	P	G	O
January	20	15	10	63.0	60.0	56.0	137	143	150	274	286	300
February	20	15	10	63.0	60.0	56.0	137	143	150	274	286	300
March	26	21	16	66.5	63.5	61.0	129	135	142	258	270	284
April	32	27	22	70.0	67.0	66	120	127	134	240	254	268
May	38	33	28	73.0	70.0	67.5	111	118	126	222	236	252
June	42	37	32	75.0	72.5	70	103	112	121	206	224	242
July	45	40	35	75.0	74.0	71.5	93	107	116	186	214	232
August	44	39	34	75.0	73.5	71.0	96	109	117	192	218	234
September	41	36	31	75.0	72	69.5	106	114	122	212	228	244
October	34	29	24	71.0	68.0	65.5	117	124	132	234	248	264
November	27	22	17	67.0	64.0	61.5	127	134	141	254	268	282
December	21	16	11	63.5	61.0	58.0	135	142	148	270	284	296

Improved in 3 ways

1. **BETTER ACCURACY**
2. **HIGHER INSULATION**
3. **SMALLER SIZE**





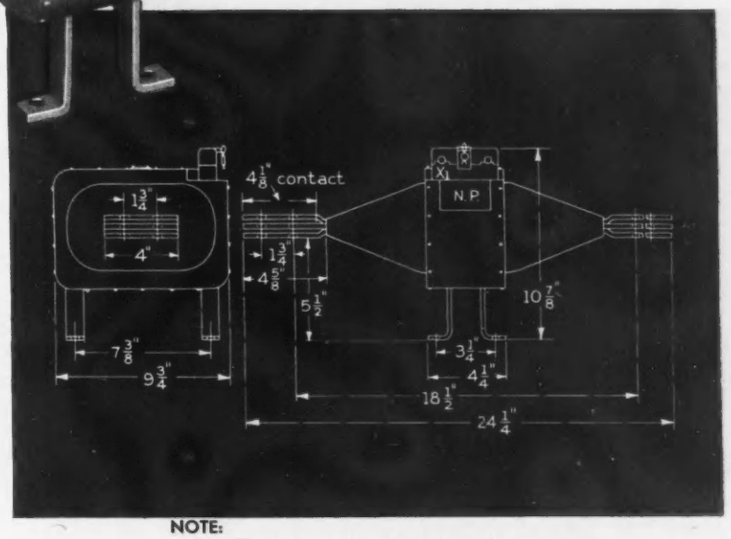
Type JK-9
Indoor Current Transformer
15 Kv—1000 to 4000 Amp
(Supersedes Type KC-51)

THE high accuracy of this transformer makes it ideal for relay applications—particularly differential relaying—as well as for metering service.

ACCURACY—During overcurrent conditions, with a burden Z, all ratings will be within eight per cent of the true ratio at 20 times normal current. The metering-service accuracy classification of these transformers is: 1000- and 1200-amp, ¼X, ¼Y, and ½Z; 1500- to 4000-amp, ¼X, ¼Y, and ¼Z.

INSULATION—The impulse strength meets the test requirements for 95 kv, full-wave, on both insulation and flashover (ASA standard for 15-kv instrument transformers).

SIZE—The JK-9 is six inches shorter than the KC-51, therefore requires less mounting space.



NOTE:
The illustration and dimensions shown apply specifically to the 3000-amp rating. The accuracy curve covers ratings from 1500 to 4000 amperes.

A COMPLETE LINE

You can adopt G-E instrument transformers as standard throughout your system, for General Electric makes a complete line—indoor and outdoor, current and potential, and portable.

For additional information about the JK-9, ask for Bulletin GEA-3876. Your G-E office has copies, or write to General Electric, Schenectady, New York.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment

GENERAL ELECTRIC

604-6-8400

Table II—2,300-Volt Induction Regulator, 57.5 Kva., 250 Amp.

95 deg. C. Average Cu. Limit — 75 deg. C. Top Oil Limit — 94% Power Factor
Ventilation: P = Poor — G = Good — O = Outdoor

Month	Ambient			Top Oil °C.			% Rating			Amperes		
	P	G	O	P	G	O	P	G	O	P	G	O
January	20	15	10	75	75	75	106	113	118	265	282	295
February	20	15	10	75	75	75	106	113	118	265	282	295
March	26	21	16	75	75	75	96	104	112	240	260	280
April	32	27	22	75	75	75	76	93	103	190	232	258
May	38	33	28	75	75	75	54	72	90	135	180	225
June	42	37	32	75	75	75	39	57	76	97	142	190
July	45	40	35	75	75	75	18	46	65	45	115	162
August	44	39	34	75	75	75	27	50	69	67	125	172
September	41	36	31	75	75	75	42	61	80	105	152	200
October	34	29	24	75	75	75	69	87	100	172	218	250
November	27	22	17	75	75	75	93	103	110	232	257	275
December	21	16	11	75	75	75	104	112	117	260	280	292

stallations, 15 C. for good conditions of indoor ventilation and 20 C. for relatively poor ventilation.

Further, the ratings were determined for recurrent cycle 40-10, 85-8, 100-6 based on 95 C. average copper or 75 C. top oil temperatures at end of load cycle peak. Regulators are assumed to be in good condition with clean oil having free circulation.

Tables I and II show the permissible loading in both amperes and percent of rating, one exhibiting a considerable margin of loading in January, the other a curtailed load capacity in midsummer.

•

Bushings Safeguarded in Storage

Doble Engineering Company, Medford Hillside, Mass., recently prepared the following instructions for users of bushings and organic insulation to facilitate protecting such equipment and material from moisture during storage. These suggestions were based on extended field experience and were incorporated in the company's engineering reference book prepared for clients' use and here made available to a wider circle of system operators.

General

1. All bushings and organic insulating materials should be stored in a clean, dry, ventilated room, preferably one that is maintained at a temperature slightly above the outside temperature, to prevent surface condensation. Heat, without ventilation, is not sufficient to prevent water absorption from surface condensation.

Compound-filled Bushings

2. All bushings should preferably be stored in a vertical position; however, this is of particular importance for compound-filled bushings. If such bushings are stored in a horizontal position, the compound is likely to flow during warm weather, leaving a void from the ground flange to the terminal. It is apparent that if such a bushing is installed in the field during cold weather the void is likely to be maintained; water may collect in the void and create a potential flashover hazard.

3. The condition of the gaskets of a spare bushing should be examined before the bushing is placed in service because one of the most frequent causes of bushing failures is the entrance of water through the gasket. The presence of moisture in a bushing can be detected most effectively with the aid of a power-factor insulation tester. However, if such a tester is not available, the next best thing is to make a "hot rod" or "flame" test for moisture in the compound.

4. The lower section of the insulation of a compound-filled bushing is frequently exposed to moisture penetration from surface condensation unless protected by a moisture-resisting covering of some kind. New bushings are usually protected by a covering when they leave the factory; however, bushings that have been in service before being placed in storage as spares may not have such a protection. It is recommended that such bushings be dried and then protected against further moisture penetration by a waterproof covering, or immersion in oil.

Oil-filled Bushings

5. Oil-filled bushings should be kept filled with oil to preserve the internal insulation.

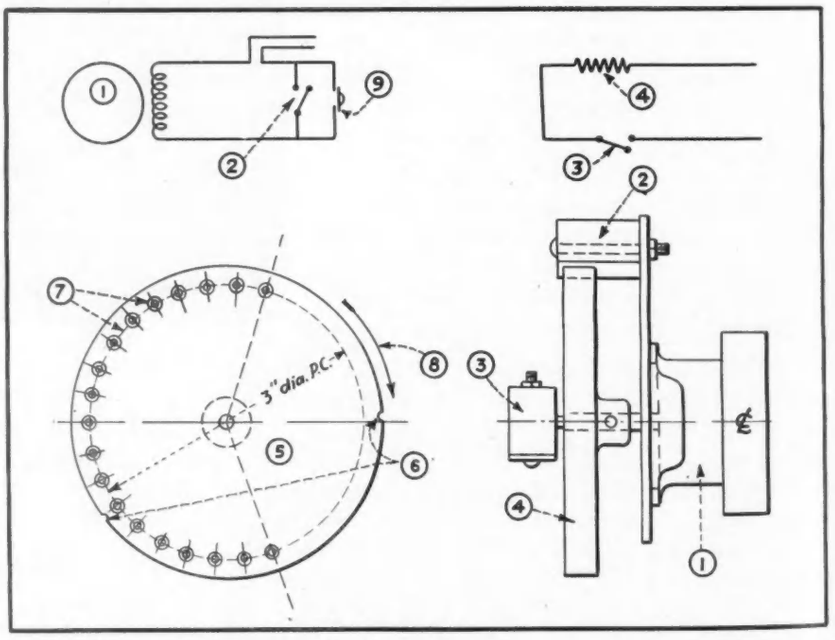
•

Push Button Starts Automatic Raid Alarm

By R. T. ABERNETHY
Captain, Ordnance Department, U. S. Army

A rather unique device for automatic blackout alarm has been constructed for use at a government-owned ordnance plant. It is equally applicable for any municipal or industrial establishment. The standard signal of eighteen five-second blasts at five-second intervals as well as the two-minute "all-clear" signal are controlled by means of a single push button used only to start each signal.

The device might be called a manually controlled, synchronous motor-operated relay. Its essential parts are two micro-switches, a clock motor, the shaft speed of which is 1 r.p.m., gearing and a timing wheel, all of which can be procured commercially except the timing wheel and gearing. The gearing should have a ratio of 5/1 to



DEVICE for automatic sounding of air raid signals

1. Clock motor drive (Haydon Mfg. Co.)
2. Motor control switch (Micro, Type YZ-R, N.O.)
3. Signal control switch (same as 2.)
4. Signal relay which closes siren circuit.
5. Signal disk.
6. Stops for motor control switch.
7. Holes and lands on disk to operate signal control switch; (19 holes equally spaced—12 deg. apart—on three-fifths of circle).
8. Rotation direction—speed, 1/5 r.p.m.
9. Push button.

rotate the timing wheel at 1/5 r.p.m.

The push button shunts the motor control micro-switch. At the zero position both micro-switches are in the "off" position. When the push button is pushed the motor starts. The switch should be held down for five or six seconds, within which time the alarm will have started to sound. By that time the motor control micro-switch will have reached the "on" position, where it will remain until the complete alarm has been sounded. Then the second groove in the periphery of the timing wheel will open the motor circuit micro-switch. The next push of the push button will similarly start the two-minute "all-clear" signal.

The signal relay micro-switch is connected to the relay controlling the sirens. It is closed five seconds and open five seconds alternately for eighteen blasts, finally remaining in the "off" position. The details of the timing wheel and location of the two micro-switches are indicated on the print. The device was designed and constructed by K. L. Travis, electrical superintendent of Lansdowne Steel & Iron Company, Gadsden, Ala.

•

Industrial Light Hood Made of Pressboard

By EDWIN D. TILLSON
Testing Engineer
Commonwealth Edison Company, Chicago, Ill.

An 8-ft. long "war hood"—fluorescent lighting fixture for standard or low mounting designed to bring urgently needed high-quality, high-intensity lighting at low investment cost to small industrial plants working on war sub-contracts—is the latest development of the Utilities Research Commission, Chicago.

The unit has not been placed on the market by the U.R.C. It was built as a suggestion to manufacturers confronted with the problem of producing lighting equipment for armament industries with a minimum use of critical materials.

Perhaps the most revolutionary feature of the new hood is the use of replaceable, hard-pressed fibre board (of the type used in motor slot insulation), bent to a parabolic contour and coated with baked-on synthetic white enamel, as the reflecting surface. Backbone of the unit is a specially designed wire-way, partially inclosing the auxiliaries, and with ribs of $\frac{3}{8}$-in. steel strap spaced on 2-ft. centers along its length, to give contour to the pressboard reflecting surface. It is intended that the pressboard reflector shall be replaced occasionally (if necessary) and eventually eliminated in favor of sheet steel.

TO SAVE STEEL and reduce ballast temperature, a special wiring channel is used from which auxiliaries project; short hood section shows arrangement of ribs and backbone

The rows of two 40-watt type F lamps in the 8-ft. unit provide sufficient light output to give 42 ft.-candles illumination on an area of 100 sq.ft. when mounted at 6 ft. 6 in. The sprayed enamel surface of the unit has a reflection factor of 82 percent, compared with the usual factor of 85 to 87 percent for conventional units.

Ribbed glass diffusing plates provided below the lamps reduce intrinsic brilliancy at normal viewing angles to 1.4 candlepower per sq. in.

Units are arranged for suspension at ends from hangers spaced on 8-ft. centers. Weight of the fixture complete is approximately 48 lb. Necessary stiffness along the back of the unit is imparted by a vertical web to which the wireway is fastened.

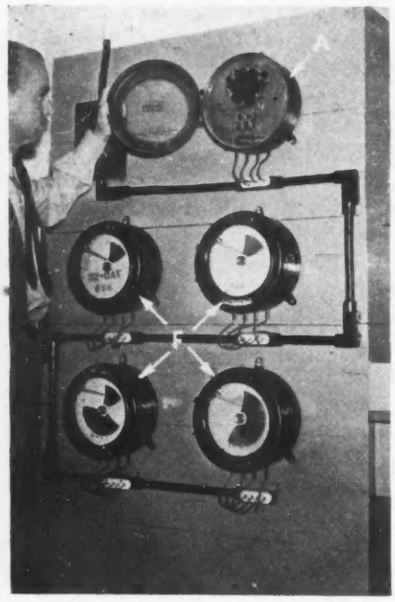
Conventional wireway of 3 x $2\frac{1}{2}$ in. section, inclosing both ballast and starters, has been replaced with a special wireway designed to conserve steel. It is 3 in. wide and $\frac{5}{8}$ in. deep. The two two-lamp auxiliaries protrude through the bottom of this smaller channel as shown in the illustration. Sufficient clearance is provided inside the wireway on each side of the auxiliary for necessary wiring. It is known that with the auxiliaries protruding from the wireway they will operate at a lower temperature than if totally inclosed. For example, on a recent test it was found that the same ballast, which when inclosed operated at 165 deg. F., subsided to a temperature of 135 deg. F. when exposed.

The large hood area reduces both metal glare and shadows, making it suitable for application where work is done on bright metal parts and deep

[*Continued on page* 98]

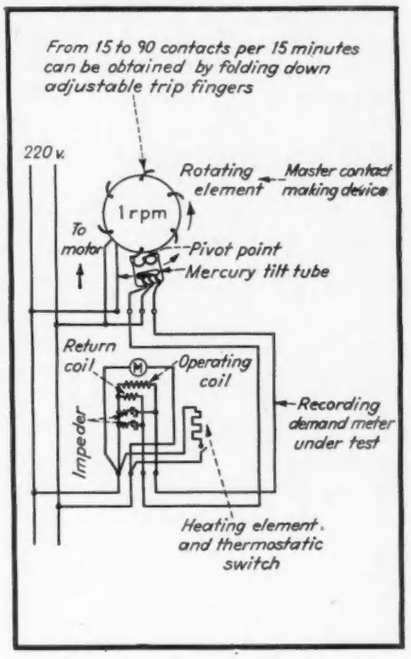
LIGHT HOOD using minimum of critical materials has pressboard reflector; can be used at standard mounting heights, or for work bench, drafting or assembly tables at low mounting heights because of its low operating temperature; yields 42 ft.-candles over an area of 100 sq.ft.; has 82 percent reflection factor

CONTACT-MAKING DEVICES FOR TESTING DEMAND METERS

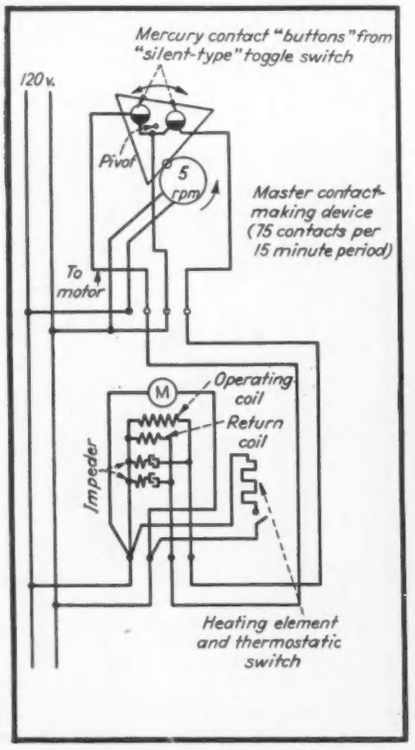


Contact-making unit (at top) installed on gang test (Dallas P.&L.)

Master contact-making device for checking recording demand meters (Dallas Power & Light) is adjustable to give 15, 30, 45, 60, 75 or 90 contacts per fifteen-minute period. Tests any convenient number of meters simultaneously. Six adjustable trip fingers on periphery of Bakelite disk making 1 r.p.m. rock a single-pole, double-throw mercury tilt tube. Each finger tilts tube in two positions in succession, first to energize the return and then the operating coils of the four demand meters. Any finger can be folded down against the disk to vary number of contacts per disk revolution from 1 to 6. Device made from spare parts.



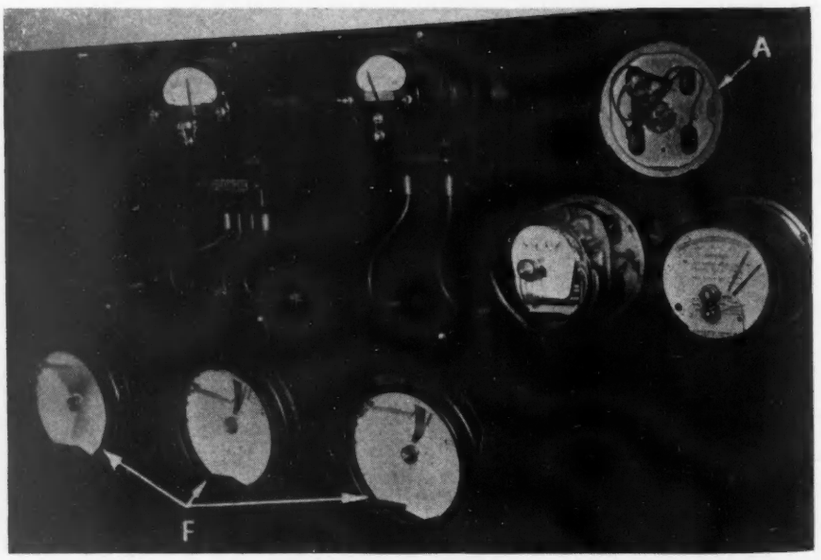
Contact-making unit wiring diagram for gang checking of demand meters, giving 15 to 90 contacts per 15-in. period (Dallas P.&L.)



Wiring diagram, contact-making device (Okla. G.&E.) and demand meter under test

Two mercury contact buttons (used in "silent type" toggle switches) mounted on a pivoted-Bakelite plate and rocked by a motor-driven disk (5 r.p.m.) form basic elements of contact-making device (Oklahoma Gas & Electric) for checking recording demand metters. Device gives 75 contacts per fifteen-minute period and can be used to test any reasonable number of meters simultaneously.

Twelve meters per batch are thus tested at Oklahoma City.



Master contact-making device (A—cover removed) checks simultaneously gang of impulse type recording demand meters F of same voltage (Okla. G.&E.)

A BETTERMENT . . .

Not a Substitute

The 1942 Scouting Plane is more than a substitute for the Observation Balloon of 1860.

The Scouting Plane is an advancement . . . a BETTERMENT!

And likewise . . . CONTINENTAL-DIAMOND NON-metallics are not substitute materials for corrosive, weighty, costly, and now hard-to-get materials. C-D NON-metallics possess unique characteristic combinations that make them ideally suited to meet many of the material problems of a war or peace economy.

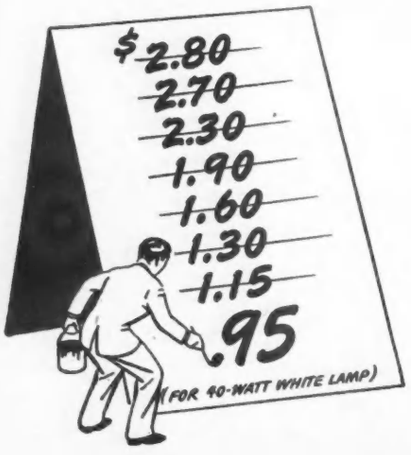
Manufacturers who design to use C-D NON-metallics to the fullest measure of their capabilities will never go back to "Observation Balloon Days" . . . because they will have built into their products NON-metallic materials which are as modern as today's Scouting Plane.

A booklet describes all FIVE C-D NON-metallics. Ask for GF-12. Then, when you are ready to get down to brass tacks, write, wire or phone us about your problem . . . or ask us to send around one of our Research Engineers.

Continental-Diamond FIBRE COMPANY

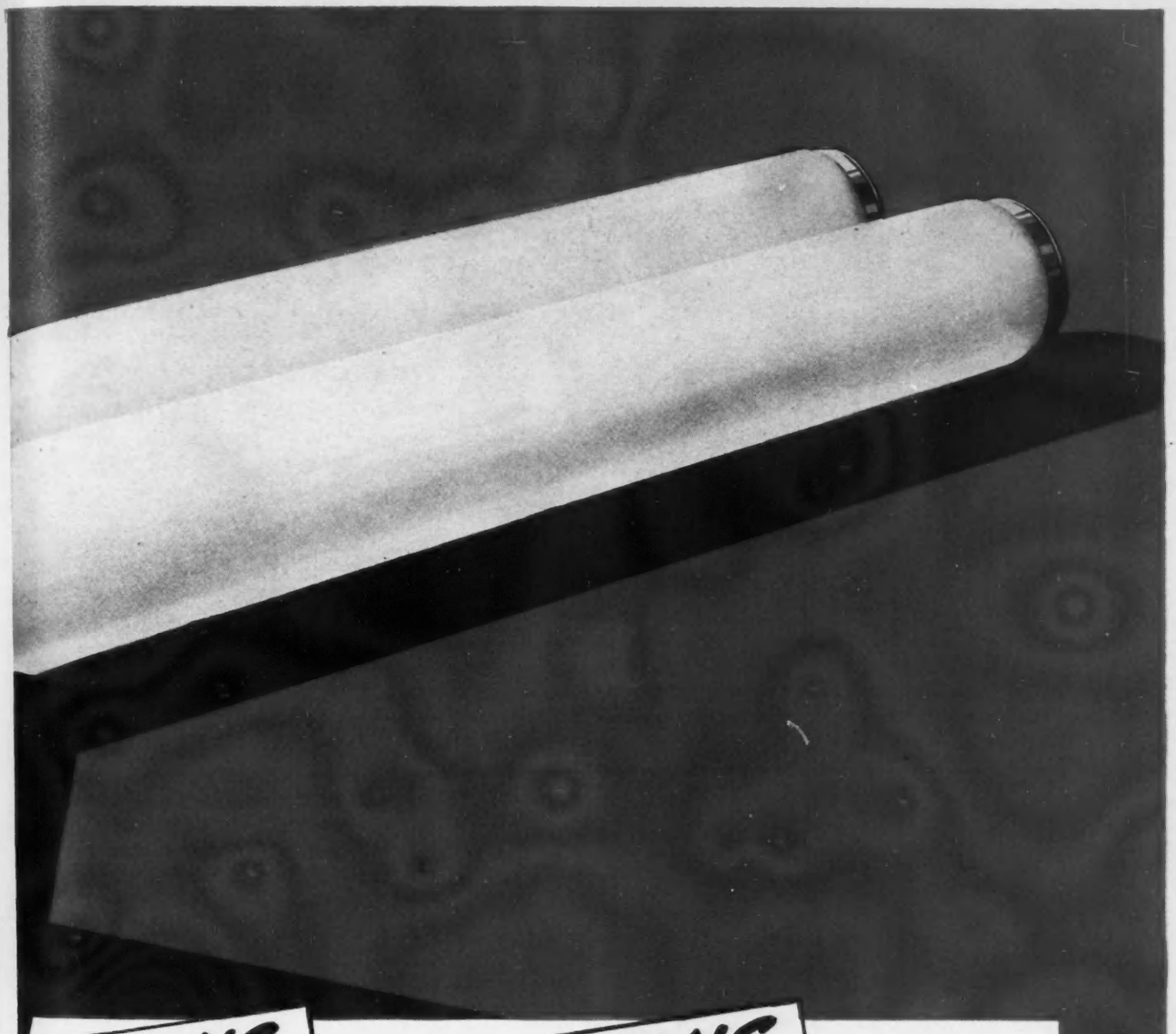
Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK • DELAWARE

Again Westinghouse Reduces Prices!



This is the kind of news you don't expect to hear today. And it's good news for every user of fluorescent lamps. Prices have been reduced 12% to 17%, giving you even lower lighting costs, even more light for your money. Here again is proof of Westinghouse leadership in lamp design, research and manufacturing know-how. But lowered prices are not all. Quality has been substantially increased too. Today Westinghouse Mazda lamps give more light, last longer and cost less.

It's Westinghouse for



PLUS

In 1939 1880 LUMENS Now 2100 LUMENS

12% Brighter Light

Technical improvements give you brighter light—in the 40 watt white lamp, for example, brightness is increased from 1880 to 2100 lumens —almost 12% more light for your money.

PLUS

A thousand Extra Hours of Life

In addition to lower costs and brighter light, Westinghouse fluorescent lamps now last longer than ever before—40 watt white lamps now have a rated life of 2500 hours —an increase of 1000 hours.

In 1939 1500 hrs. Now 2500 hrs.

FLUORESCENT

New low prices, on Westinghouse Mazda Fluorescent Lamps, effective September 1st

14-watt T-12 reduced from 80c to **70c**
15-watt T-12 reduced from 80c to **70c**
30-watt T-8 reduced from 80c to **70c**
15-watt T-8 reduced from 65c to **57c**
20-watt T-12 reduced from 80c to **70c**
40-watt T-12 reduced from $1.15 to **95c**
100-watt T-17 reduced from $2.60 to **$2.15**

The above prices are for daylight and white lamps.
Prices on Westinghouse soft white and colored fluorescent lamps are also reduced.

Prices on MAZDA H (MERCURY) also Reduced

400-watt T-16 AH1 reduced from $11.00 to $9.50
400-watt T-16 BH1 reduced from $11.00 to $9.50
3000-watt T-9½ AH9 reduced from $45.00 to $40.00

Better Light at Lower Cost

intricate assemblies. It is ideal for use over benches and drafting tables, in layout lofts, along moving assembly belts and over stationary assembly points where such fine work as in assembling aircraft instruments and military optical instruments requires a high degree of lighting quality. While primarily intended for use as a hood at around 6 ft. mounting height, the unit can be mounted at 10 ft. heights to give satisfactory general illumination levels where seeing conditions are not critical.

•

New E.E.I. Standard for Splicing Sleeves

Single-tube seamless copper splicing sleeves, of the type commonly used in overhead line construction, are the subject of the latest E.E.I. line hardware specification, TD-9, compiled by the line hardware subcommittee of the Edison Electric Institute's Standard and Specification Group. The new specification, issued during July, supersedes the old N.E.L.A. specification D950-31T and includes both the oval and the grooved oval type of sleeve for conductors ranging in size from 500,000 cir.mil to No. 14 AWG, solid and stranded copper, Copperweld-copper, Copperweld, Amerductor, steel conductors (3-wire) and steel strand. Dimensions are given in the table in the accompanying illustration.

Dimensional part of the specifications for the copper conductors is based upon accepted standard practice now in use. For steel and steel-reinforced conductors and steel strand, however, the dimensions are based on expressly made actual tests.

Feature of the specification is the limited number of sleeve sizes required for all of the conductors ordinarily used for overhead line construction. This reduces the number of sizes carried in stock by some of the manufacturers and is of particular merit during these times.

It is to be noted that for Amerductor and all-steel conductor slightly longer sleeve lengths have been specified in the standards to provide adequate holding power. This is not considered a hardship to manufacturers since the same size tubing is used as for the shorter sleeves. Sleeves tinned on the inside by the hot-dip process are specified for steel, Amerductor and steel strand conductors.

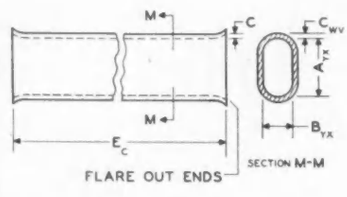
Because it would require extensive investigation and test, the specification does not stipulate the number of sleeves or number of turns required to develop the proper conductor strength, except where American Steel & Wire Company specifically asked that this information be specified for sleeves used with Amerductor and Amersteel. Although two types of sleeves are included in the specification the grooved oval type is usually preferred for steel and steel-reinforced conductors.

Test Results

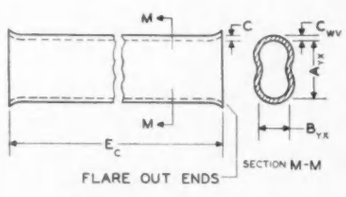
It was found that the actual fit of the sleeve over the conductor was not as important as the state of the anneal of the sleeves. Material section of the specification, therefore, carefully states that the copper tubing used for the sleeves be annealed copper tubing made in accordance with A.S.T.M specification B68-41T and is seamless copper tubing, bright annealed, which is given a fine grain anneal before forming.

There is a considerable variation in strength of joints made with sleeves of the same dimensions, made up in the same manner, due to the annealing process of the sleeves. Joints made in high-strength steel strand with sleeves of the same dimensional requirements made in regular production showed a variation in holding power of from 35 to 95 percent of the ultimate strength of the cable.

Examination of the sleeves revealed a difference in hardness, the low-strength sleeves being much softer than the high-strength sleeves when tested by the Rockwell hardness test. Microscopic examination of the crystal structure of the copper revealed complete removal of work hardening in low-strength sleeves and evidence of recrystallization and grain growth. This change was due to annealing at too high a temperature and for too long a time or a combination of both. The fine grain anneal called for in the specification provides the proper physical characteristics.



OVAL TYPE [5]



GROOVED OVAL TYPE [5]

SLEEVE DIMENSIONS FOR VARIOUS CONDUCTORS [4]

CONDUCTOR SIZE A.W.G. OR COPPER EQUIVALENT						BWG SIZE	DIAMETERS	NOMINAL DIMENSIONS—INCHES				
SOLID		STRANDED				STEEL CONDUCTORS (3 WIRE)	STEEL STRAND [2]	ALL CONDUCTORS			NOTE 6	NOTE 7
COPPER	COPPERWELD	COPPER [1]	COPPERWELD COPPER	COPPERWELD	AMERDUCTOR [3]			A	B	C	E	E
		500MCM						1.720	0.880	0.085	24	
		300MCM						1.350	0.880	0.074	21¾	
		250MCM		5/8 (7 NO. 4)				1.251	0.637	0.072	21	
		0000		9/16 (7 NO. 5)				1.156	0.589	0.065	19½	
0000	0000	000		1/2 (7 NO. 6)			1/2	1.018	0.519	0.058	18	
000	000	00		7/16 (7 NO. 7)			7/16	0.903	0.460	0.058	16	
00	00	0	2A	3/8 (7 NO. 8) 3 NO. 5			3/8	0.809	0.412	0.058	14	
0	0	1	3A	11/32 (7 NO. 9) 3 NO. 6	4	4	5/16	0.717	0.367	0.049	12½	12½
1	1	2	4A	5/16 (7 NO. 10) 3 NO. 7	8X		9/32	0.640	0.327	0.049	11	11
2	2	3	5A	3 NO. 8 3 NO. 9	6	6	1/4	0.565	0.290	0.049	9¾	11¾
3	3	4	7A & 6A	3 NO. 10	10			0.510	0.258	0.042	8½	10¾
4	4	5	8A		8&12	8		0.448	0.230	0.042	7½	8¾
6	6							0.352	0.179	0.035	6	
8	8							0.278	0.140	0.035	5	
9	9							0.248	0.125	0.032	5	
10	10							0.219	0.111	0.032	4	
12	12							0.174	0.088	0.028	4	
14								0.142	0.072	0.028	4	

SLEEVES FOR STEEL AND AMERDUCTOR CONDUCTORS TO BE TINNED ON INSIDE IN ACCORDANCE WITH SECTION 6.3

1- CABLE SIZES ARE IN ACCORDANCE WITH A.S.T.M. SPECIFICATION B8-41, 7 OR 19 WIRE STRAND. FOR 3 STRAND CABLE A.W.G. SIZES 1,2,3,4 USE NEXT LARGER STRANDED SIZE SLEEVE.

2- STRAND DIAMETERS IN ACCORDANCE WITH A.S.T.M. SPECIFICATIONS A122-41 AND A218-41.

3- AMERDUCTOR TYPES S.C.P. AND S.C.G.

4- THIS TABULATION IS FOR DIMENSIONAL REQUIRMENTS ONLY AND IS NOT A RECOMMENDATION FOR THE NUMBER OF SLEEVES OR NUMBER OF TURNS REQUIRED TO DEVELOP THE PROPER CONDUCTOR STRENTH, EXCEPT THE AMERDUCTOR MANUFACTURER RECOMMENDS 5½ TURNS FOR AMERDUCTOR AND FOR ALL STEEL CONDUCTORS.

5- THE GROOVED OVAL TYPE IS USUALLY PREFERRED AND IS RECOMMENDED FOR STEEL AND STEEL REINFORCED CONDUCTORS.

6- REGULAR LENGTHS FOR ALL CONDUCTORS EXCEPT AMERDUCTOR AND ALL-STEEL CONDUCTORS.

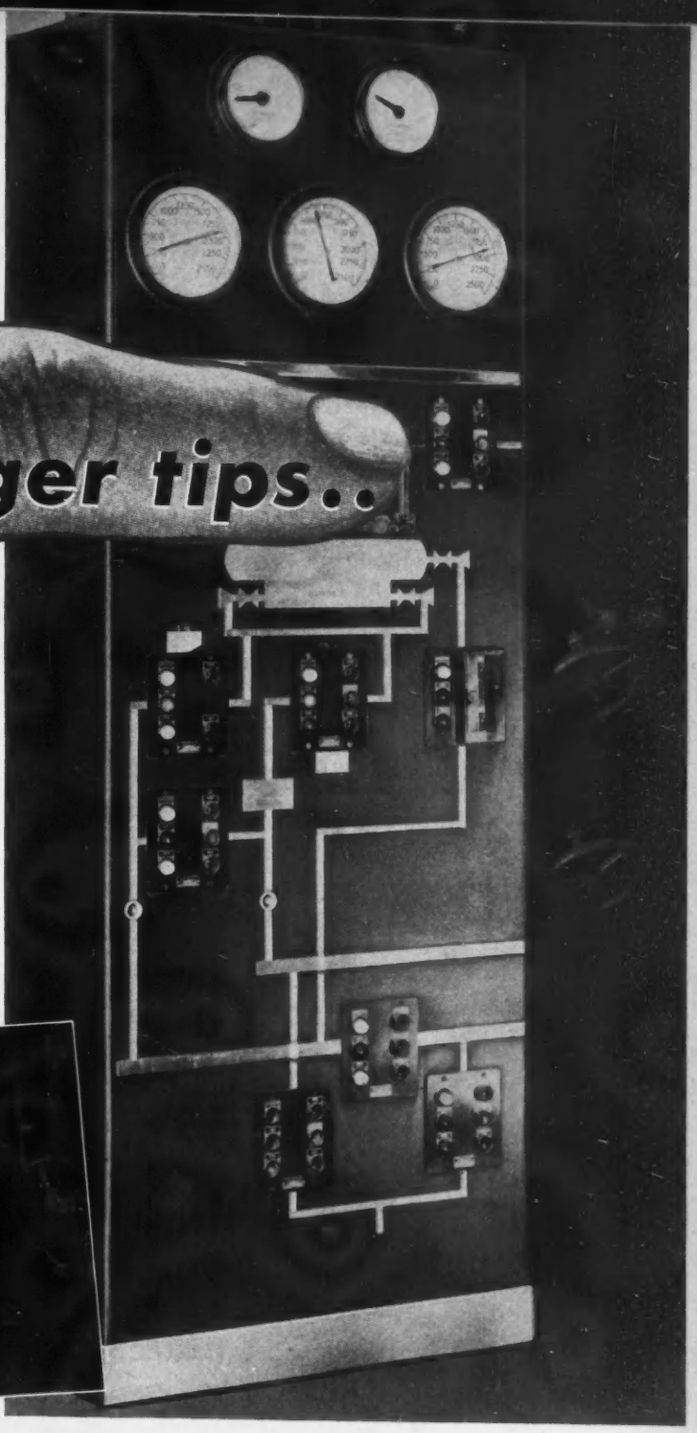
7- SPECIAL LENGTHS FOR AMERDUCTOR AND FOR ALL-STEEL CONDUCTORS.

C----- $\frac{1}{16}$ W---10%
Y---0.005
V----5% X---0.000

ALLOWABLE VARIATIONS
SINGLE LETTER INDICATES SAME + OR -, C= $\pm\frac{1}{16}$
TWO LETTERS INDICATE, FIRST + SECOND -, WV = +10% -5%

VALVE CONTROL

at your finger tips..

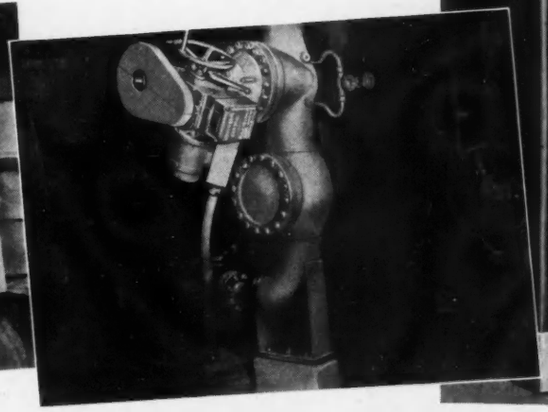


...ings up to an individual, conveniently ...ted push button station or a central ...or control panel and you can open or ... valves equipped with LimiTorque ...trols without loss of time or effort. ... operation can be kept in the hands ...sponsible, key workmen only.

...Torque Controls are adaptable to all ... of valves, from 3" to 96" diameter and can be fitted to existing equipment, if desired.

Many central stations, hydro-electric plants and private power plants throughout the country equipped with LimiTorque attest its thorough dependability in ordinary daily service as well as for emergency use.

Write us for more information.



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INDUSTRIAL GEARS
AND SPEED REDUCERS
...ITORQUE VALVE CONTROLS

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PHILADELPHIA, PA.
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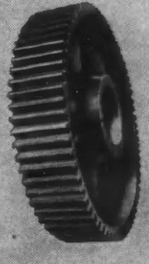
Philadelphia
LIMITORQUE CONTROL
...perates all types of valves, etc., ...afely, economically, from convenient stations.



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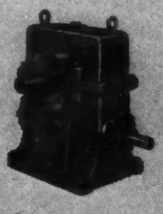
All types and sizes of industrial gears. Can be supplied in all materials.



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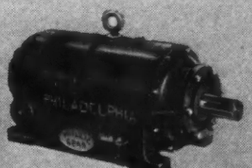
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.



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HOW TO INSTALL ANCHOR GUYS*

FOR LESS THAN 10 KV.

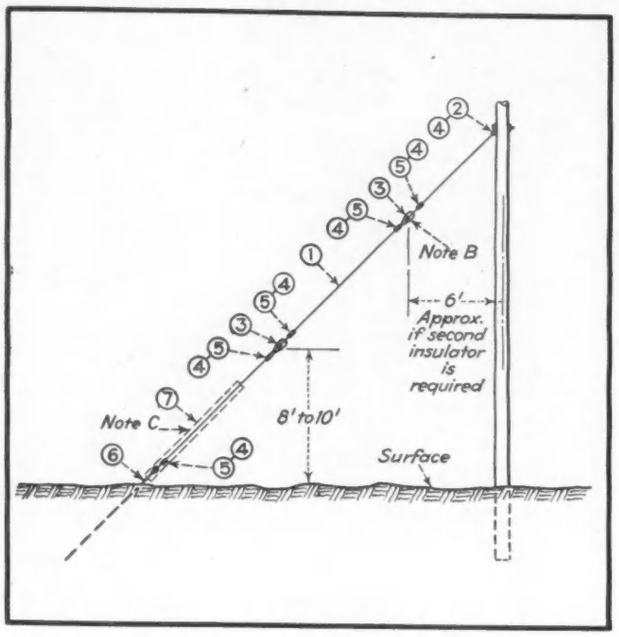


TABLE OF STANDARD ANCHOR GUYS

Item No.					
	Anchor guy Std. No.	2330	2331	2335	2337
	Maximum load, lb.	1,100	3,400	7,000	11,000
1	Guy wire — description	3 str. No. 11	5/16 in. 7 str.	3/8 in. 7 str.	7/16 in. 7 str.
2	Pole attachment	Std. 2361 or 2363			
3	Insulator	See list of Code numbers for respective parts			
4	Clip	See list of Code numbers for respective parts			
5	Guy clamp, No. per point	1	1	2	3
6	Anchor	Std. 2312, 2315, 2318			2316, 2318
7	Guy guard	See list of Code numbers for respective parts			

A. Standard anchor guy 2330 shall be used for light rural lines only.

B. Use second insulator when upper section of guy passes over or under supply conductors of more than 300 volts to ground. This insulator shall not be used when it would be located less than 8 ft. from the lower insulator.

C. Install protector when guy is exposed to traffic.

D. Attach guy as near as practicable to center of load.

E. Refer to Standard 2300 for use of copper-covered guy strand and anchor rods; also guys where lines over 10 kv. are involved.

FOR 10 KV. AND HIGHER

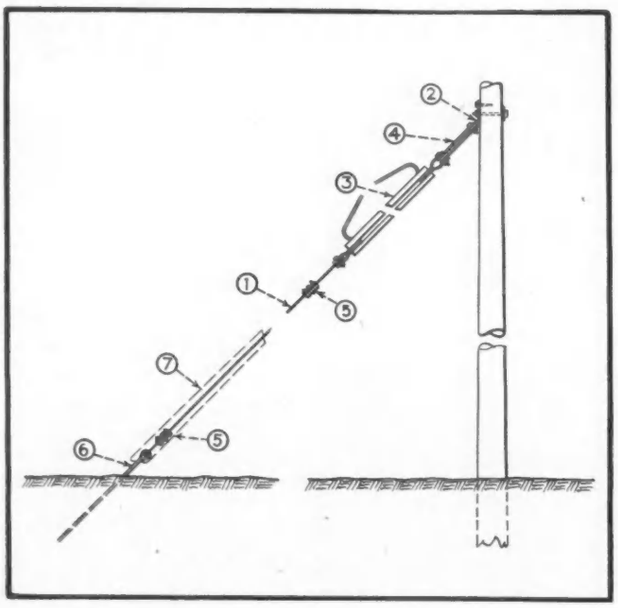


TABLE OF STANDARD ANCHOR GUYS

Item No.				
	Anchor guy, Std. No.	2350	2351	2352
	Maximum allowable load, lb.	3,250	7,000	11,000
1	Guy wire — description material	7/16 in. 7 str. Common steel	1/2 in. 7 str. S.M. steel	1/2 in. 7 str. H.S. steel
2	Pole attachment	see Std. 2363.4		
3	Guy insulator, see Note B, amount	1	1	1
4	Guy insulator extension (when specified), amount	1	1	1
5	Guy clamp, amount	1[a]	1[a]	2[a]
6	Anchor	Std. 2312, 2314, 2316 or 2318, as specified		
7	Guy guard	when required		

[a] Number required at each point.

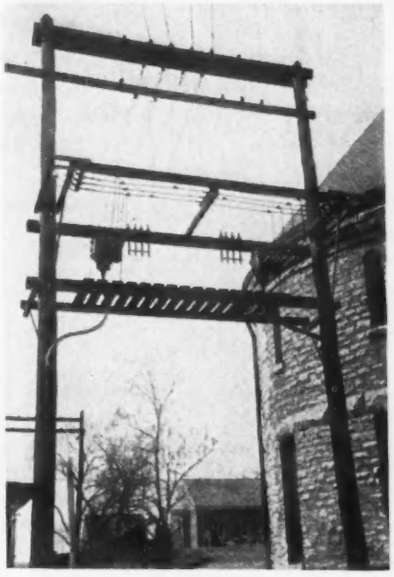
A. Use one guy clip on each free end of guy wire.

B. Horns should be bent or cut so as to provide gap and clearance shown on print M-1540. They should be so located as to give maximum clearance from live conductors, but should never be placed below the wood insulator.

*From a book of standardized practices of New England Power System.

Load Transfer Made Under Oil

Transition from underground to overhead 2,400-volt distribution on the grounded neutral system of the Iowa Electric Light & Power Company, Cedar Rapids, is made through G&W plug-disconnect type oil-filled terminal boxes in the manner shown. Use of PD terminal boxes in this case permits breaking load under oil without reverting to more expensive equipment.



UNDERGROUND preferred and emergency feeder cables transfer to overhead circuits through plug type oil-filled terminal boxes, permitting load break under oil

In the case of the transfer point shown two underground feeder cables (one preferred, the other emergency) from a nearby generating station terminates in potheads, from either of which connection can be made to the overhead system by the insertion of bayonets or plugs connecting the cable pothead terminals within the box to outgoing bushing studs. When not in use "live" plugs are supported in a holder on the crossarm adjacent to the terminal box (as shown) and "dump" plugs inserted to keep the box weathertight.

•

Job-Material Bins Save Crew Time

Oklahoma Gas & Electric Company has found a simple way to cut down the stores requisitions issued against

How to Make

AMERICAN BODIES

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Keep your present American Bodies on the job for the duration. American all-steel bodies built years ago are proving their superiority in giving top-flight service today. See to it that they remain in prime condition to protect your lines and work for Victory.

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Make over-all check-ups frequently.

Inspect all panels and posts to detect minute cracks or failures that might develop trouble.

Clean any bad spots in paint and touch up.

Keep accessories — winches, power take-offs, etc., well oiled; also, locks and hinges.

Tighten bolts wherever they become loose.

Things We Can Do . . .

Provide parts to replace any that become damaged, lost or worn. We aim to keep on hand a complete stock of parts for all bodies made by American, ready for prompt shipment. As all American parts are standard, they fit into place easily, and give as sturdy service as those they replace.

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to stay alive

Fourteen inches back of that barrier runs a high tension bus. Let a man forget to trip the controlling oil switch before opening that protecting door and he'd never forget again. But with this barrier, he *can't* forget.

To open the door equipped with a Bendix-Cory Type B-1496 Interlock he must have the key. And to release that key from its present location, he must open the line oil switch. Then, and only then, can he get at that bus.

Bendix-Cory Interlocks are built in dozens of types and designs to guard against the kind of habit or memory failure that means fatality. Write us for specific suggestions on the form of Interlock best suited to meet your current problems of protection.

MARINE DIVISION
BENDIX Aviation Corporation
1 Hanson Place, Brooklyn, New York

a given work order. Each construction foreman is provided with an open bin (everybody's honest in Oklahoma) where *all* equipment and material for a given job is stored until that job is completed. Withdrawals are made from the bin as material is needed.

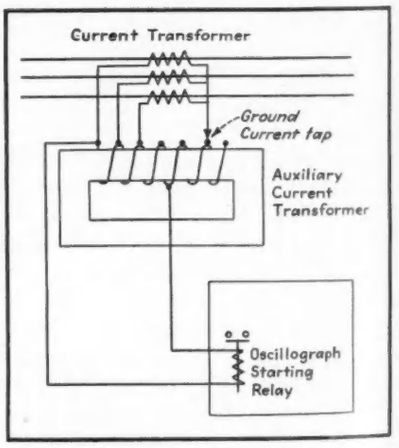
Instead of issuing a new requisition daily for the next day or two day's needs one requisition is issued at the beginning of the job for needed supplies. At the end of the job the unused balance is charged back into stock on a single ticket. Besides saving anywhere from fifteen minutes to an hour of crew time daily the simple practice materially reduces stores bookkeeping.

•

Oscillograph Starts on All Faults

By V. D. HOLLIS
Operating Department, Central Illinois Public Service Company, Springfield

Usefulness of an automatic oscillograph on a transmission tie-line is increased by arranging the connections so that it records for all types of faults, both phase and ground, and also records heavy three-phase power surges which accompany or precede out-of-step conditions. This may be done without a multiplicity of high-



THESE CONNECTIONS serve to start automatic oscillograph on any kind of fault

speed relays by connecting the starting relay in the oscillograph to a small auxiliary current transformer of the type described by McConnell and Neher in *Trans.A.I.E.E.*, Vol. 60, page 12.

This transformer supplies a single-

Conserve Copper
WITH ROCKBESTOS

Look into the copper-saving possibilities of Rockbestos wires and cables before you lay out your next wiring job. Their heatproof and fireproof insulation gives you greater carrying capacity, size for size, because it can be run hotter (Type AI, 125°C.-257°F., Type AVA, 110°C.-230°F., 1940 Nat. Elec. Code page 286). This means that in many installations you can use smaller conductors safely and save vital copper.

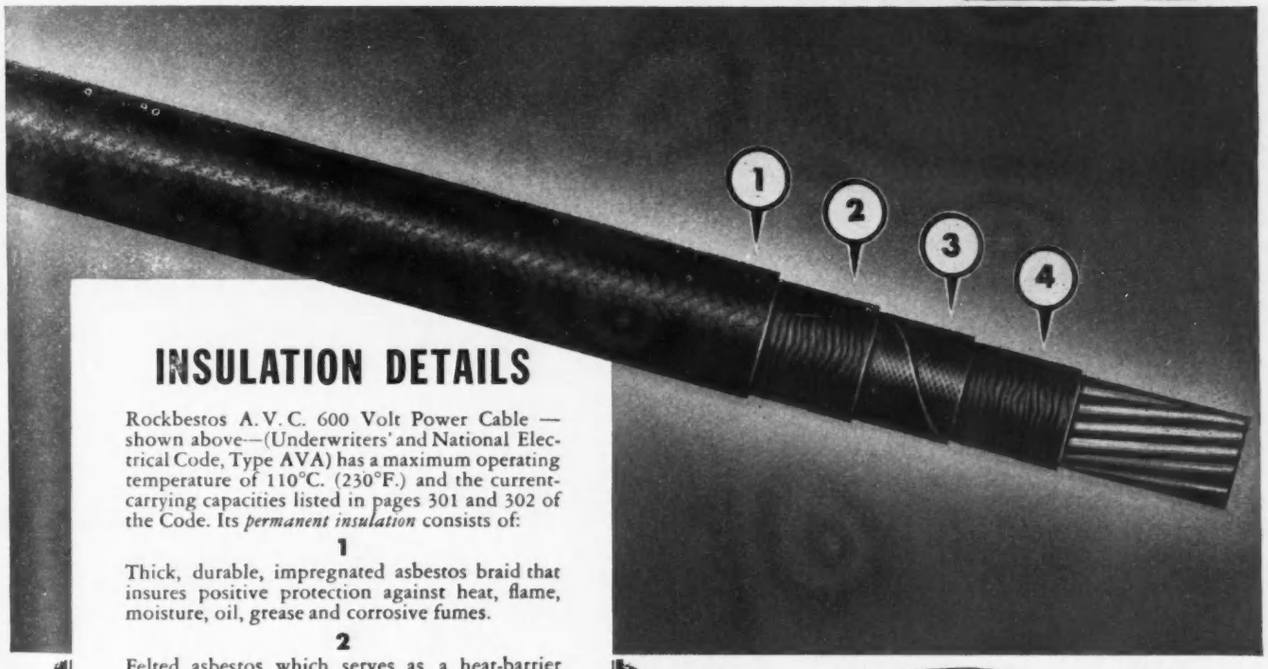
And you'll save more than copper because Rockbestos wires and cables are built to stand up *permanently* under severe operating conditions—heat—moisture—oil—grease—corrosive fumes—fire. They won't bake brittle, bloom, burn or rot, but they will eliminate a lot of failures, wire-fires, and resulting production losses.

1½ Tons of Copper Saved on a Single Job

Here's an example of the copper-saving possibilities of Rockbestos Power Cables. A defense plant job needed 4000 feet of cable for a 750 ampere load—cables to be installed open on insulators. The use of 700,000 CM Type SBW cable (N. E. C. rating 760 amps.) had been considered. We suggested 450,000 CM Rockbestos All-Asbestos Power Cable, N. E. C. Type AI, rated at 755 amps., because of its higher permissible operating temperature ---- *which would save 1½ tons of copper!*

Then, for a better job, we recommended 500,000 CM Rockbestos A. V. C. Power Cable, N. E. C. Type AVA rated at 765 amps., installed on messenger to eliminate the excessive reactance drop of open wiring—*which still saved almost 1½ tons of copper* over the use of Type SBW.

Our engineers may be able to analyze your job with similar results.



INSULATION DETAILS

Rockbestos A. V. C. 600 Volt Power Cable — shown above—(Underwriters' and National Electrical Code, Type AVA) has a maximum operating temperature of 110°C. (230°F.) and the current-carrying capacities listed in pages 301 and 302 of the Code. Its *permanent insulation* consists of:

1

Thick, durable, impregnated asbestos braid that insures positive protection against heat, flame, moisture, oil, grease and corrosive fumes.

2

Felted asbestos which serves as a heat-barrier against high ambient temperatures.

3

High-dielectric varnished cambric, protected from heat, flame and oxidation by two felted asbestos walls, gives added moisture resistance.

4

Inner felted asbestos wall which is unaffected by conductor-heating overloads and won't burn when exposed to copper-melting arcs.

Other Rockbestos constructions—with similar insulation—include Control and Motor Lead Cables, Boiler Room and Lighting Wire.

When Ordering give end-use classification and authorized preference rating. For information write to the nearest branch office listed below or Rockbestos Products Corporation, 862 Nicoll Street, New Haven, Connecticut.

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The Wire with Permanent Insulation

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When a line must be strung—in a hurry—a soldier has no time to baby tools. Under war conditions, Klein pliers and equipment are proving the wisdom of the policy of extra quality—of added care in manufacture that has made the name of Klein synonymous with the finest in tools among linemen and electricians—everywhere. Today, as in the past, under the acid test of war, this equipment is proving to our sailors and our soldiers here and in foreign lands that, the extra quality that has characterized Klein equipment "since 1857" assures better work—performed on time.

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phase current for all types of faults and for three-phase surges. By proper selection of the tap on the ground current winding this current will be greater than the full-load value.

•

More Steam—How?

8. Slag, Ash, Boiler Design*

By ALFRED IDDLES
Application Engineer
Babcock & Wilcox Company

Recently I saw a specification for a slag tap furnace to handle coal with ash fusion temperature from 1,900 to 2,800 F. As far as stated, the engineer expected to obtain equally good results with any of these coals. Naturally this is a condition which any of us would like to obtain, but which is impossible with our present knowledge.

If the engineer had specified the same range of fuel with dry bottom operation, then it would have been necessary to design the boiler around the lowest fusion temperature. This would have meant a large unit, or, as has so frequently happened, the unit would have been designed for what somebody guessed was going to be the average coal. If the fusion temperature were lower, then slag difficulties very likely would occur. If the temperatures were higher, of course the unit would be entirely satisfactory providing it was the correct design for the assumed average.

The engineer might have specified the coal which was his normal supply, and might have stated that he wanted to be able to burn the lower fusion coal and how much he was willing to pay for the extra size to provide for such low grade fuel. Most every one understands that on a dry bottom job difficulties are likely to occur with low fusion ash and high loads whereas with a slag tap job the difficulties will occur with a high fusion coal and low loads. The operating cycle or load factor on the unit has an important bearing upon which choice should be made. The buyer or operator could profitably obtain a measure of the best operating point for the unit being considered and evaluate in some degree the good and bad points in

*This series began in the May 16, 1942, issue of "Electrical World," adapted from author's talk "What the Operator Wants to Know" to Steam Power Division, A.S.M.E., Metropolitan Section, March 25, 1942.

full view of his own knowledge of operating conditions. If he truly wishes a universally applicable job, then he must realize that this usually means a more costly unit than would be necessary for a more restricted set of conditions.

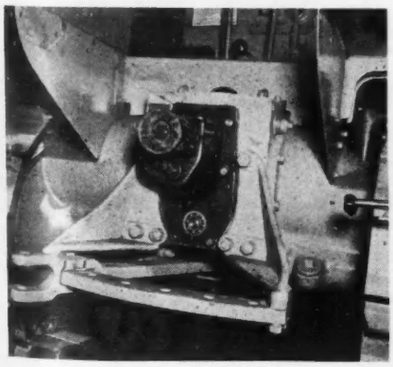
Of course I realize that sometimes purchasing agents are independent of operators and that apparently the purchasing agent who buys the unit seldom buys the coal. If he did and could believe his operators, then he might not be as extreme in two different directions as sometimes happens.

An operator need have no trouble with slag in the convection surface. Standard practice now provides for tube spacing and cooling surface ahead of the convection surface to prevent such troubles. However, loads beyond the capacity of the unit or some exceptional fuel which the above purchasing agent may buy may impose conditions that were not at all contemplated in the design and trouble is likely to result. Such troubles are more prevalent in these war-times than ever and of course we are all interested in overloading and getting by in the best manner possible.

•

Flexible Power Take-off for Tractor

Power take-off of a tractor is a handy thing, useful in many ways for driving portable machinery, turning winches and reels, all the many odd jobs that are encountered in electric utility construction and maintenance. But the take-off has only one speed control, the throttle of the tractor motor. How much handier and more useful if it had two or three fixed speeds forward and a



AUTOMOBILE TRANSMISSION improves power take-off

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Assure Prompt Delivery!

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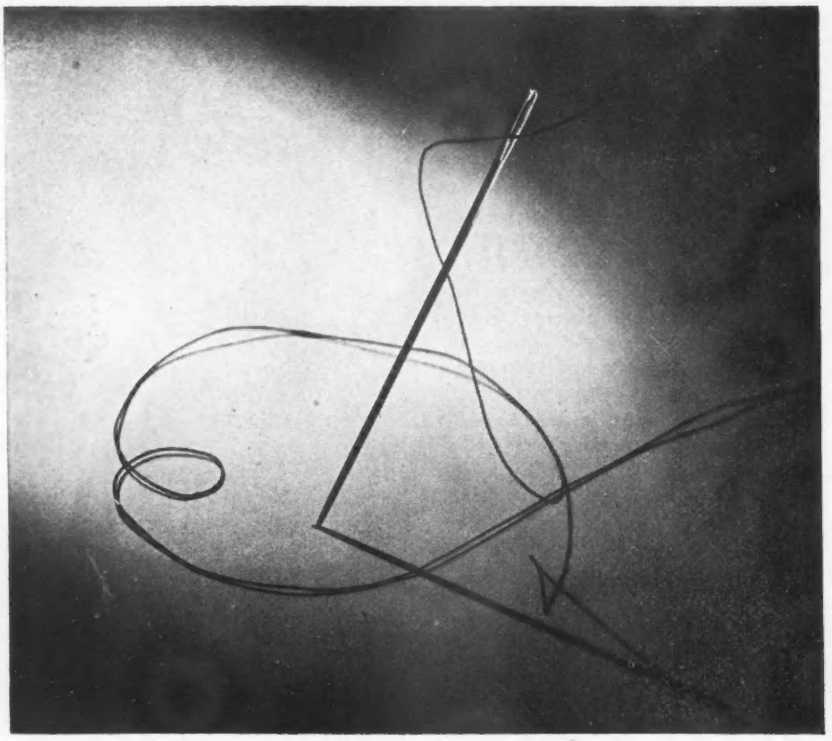

THE EYE OF A NEEDLE

In a needle's eye we see a moral for industry. Just as the delicate job of threading a needle goes easier and faster when there is plenty of light, so the delicate jobs of industry are done better and quicker with adequate lighting, properly placed. You can count on Silv-A-King equipment to give you plenty of light, and on Silv-A-King's 21 years of experience for proper layout and installation. Silv-A-King lighting engineers will be glad to advise you on either fluorescent or incandescent installations.

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PITTSBURGH PLATE GLASS
and many others

FLUORESCENT · INCANDESCENT
SILV-A-KING
EQUIPMENT

SILV-A-KING MAKES *Light* WORK FOR YOU

reverse. Which was not hard, as appears in the accompanying picture, taken in the shop of the Alabama Power Company.

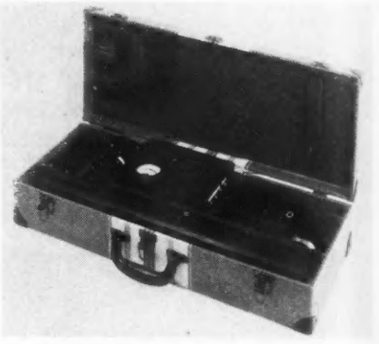
On the front of the tractor was mounted a gearshift taken from an old automobile. The power take-off shaft of the tractor drives the automobile transmission through a chain belt. The picture shows the job partially completed. Below the gear box can be seen the end of the take-off shaft in a ball bearing. When finished, the tractor will have an extremely flexible power take-off, three speeds forward and reverse, and will be able to fill almost any portable power requirement.

•

Meters for Measuring "Blackout" Brightness

By A. H. TAYLOR*
*Physicist, Lighting Research Laboratory, General Electric Co., Nela Park, Cleveland

For the "blackout" lighting era a recent and widely adaptable instrument for general use over a wide range is the Luckiesh-Taylor brightness meter,* which has a brightness



TAYLOR model A low-brightness meter, range 0.15 to 0.0000075 ft.-lambert; gradient wheel projects from side of side tube; it carries a brightness scale

range of 50,000 to 0.002 ft.-lamberts. Brightness under so-called blackout conditions may range all the way from practically complete darkness up to a few hundredths of a ft.-lambert.

At low-brightness levels, below 0.1 ft.-lambert, the maximum sensitivity of the eye is shifted toward shorter wave lengths. At levels above 1 ft.-lambert the wave length of maximum luminous efficiency is approximately λ 5,550; at a brightness of 0.0001 ft.-lambert it is approximately λ 5,100,

*The Science of Seeing; M. Luckiesh and F. K. Moss, Van Nostrand, New York, 1937, page 323.

and at intermediate brightnesses it lies between the above wave lengths. Since the eye does not have a constant sensitivity throughout this region, it is obvious that it cannot safely be replaced by a physical instrument or photocell of constant spectral sensitivity.

Two new low-brightness meters (A. H. Taylor, *Illuminating Engineering*, 37, 19, January, 1942) have recently been developed in this laboratory to fill the need for photometers to measure these small quantities. The Taylor Model A meter (page 106) can be used throughout a range from 0.15 to 0.0000075 ft.-lambert and was specially developed for research purposes. Model B (above) covers a range from 0.3 to 0.0002 ft.-lambert and is generally adequate for blackout conditions.

TAYLOR model B low-brightness meter, range 0.3 to 0.0002 ft.-lambert; range can be extended downward by a 0.1 setting of the voltmeter; viewing tube mounted on face

In Model A the photometric field is composed of concentric circles, the comparison field being seen in a 2.5-deg. central field and the test field in the surrounding ring, outer diameter 2.75 in. or 6 deg. Near the outer end of the side tube is a small flashlight lamp, supplied by batteries located in the separate control box shown. Near the lamp is an opaque diaphragm having a small central hole through which light is incident on a circular photographic-film gradient and a diffuser which can be rotated about the axis of the gradient to vary the amount of light transmitted. This light illuminates a flashed opal glass and blue filter at the intersection of the tubes. An elliptical mirror, mounted centrally in the long tube opposite the opal glass at 45 deg. to the axis, images this opal glass to form the comparison field.

The Model B meter is a somewhat more conveniently portable instru-

HERE ARE TWO WAYS TO SAVE ON PYREX INSULATORS!

1. SAVE ON INITIAL COST AND INSTALLATION

"PYREX" 10-in. Insulators are now 8 to 13% lower in price than competitive 10-in. units.

"PYREX" 9-in. Insulators are now 17 to 21% lower in price than competitive 10-in. units.

Stable one-price-to-all basis. Fewer than ½ as many price changes for "PYREX" Insulators as for competitive units in past 5 years.

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"PYREX" 18,000-lb. suspension units duplicate the performance of 25,000-lb. competitive units. And in M & E tests at 25,000 lbs. and higher, 95% of breaks are in hardware, not in glass.

No "PYREX" Insulator has ever been reported to us by users as having failed from electrical causes alone.

A recent independent analysis indicates "PYREX" Insulators will eliminate ⅓ of all failures (electrical and mechanical).

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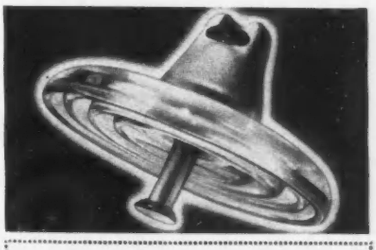
THERE are really only two major ways you can save on insulators, in wartime or in peacetime. First, you can save on initial cost. Second, you can save by buying superior performance. And today you can make both savings with the *same* insulators — "Pyrex" Insulators. Lower first cost, unmatched dielectric strength, high load strength, great arc resistance, and unexcelled weathering qualities combine to give you extremely low long-time cost. Investigate Pyrex Brand Insulators now. For full information, write Insulation Division, Corning Glass Works, Corning, N. Y.



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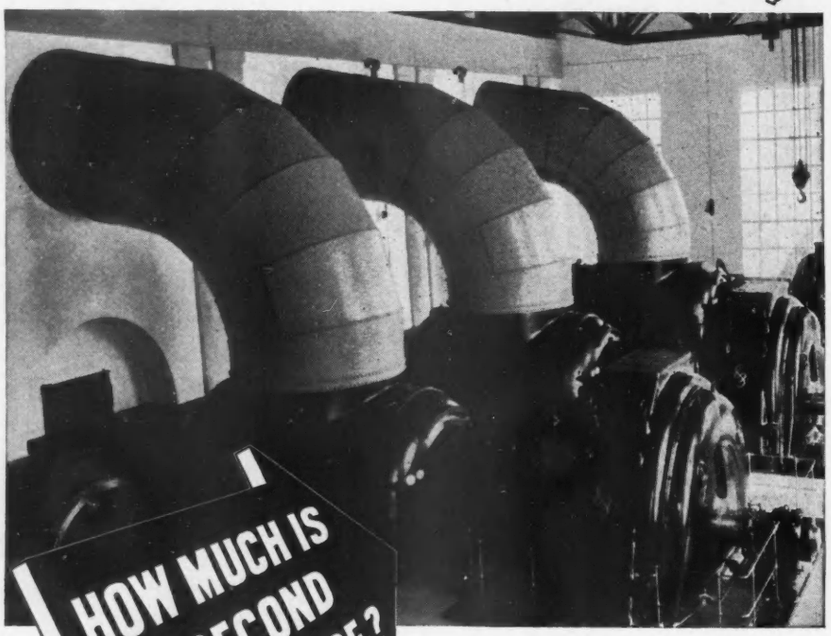

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When sudden fire endangers precious equipment and the lives of experienced employes . . . when it threatens to halt the steady flow of power, *split-second speed* is all important.

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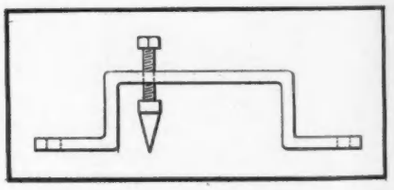
ment of lower accuracy and more limited brightness range. However, its range is sufficient to cover the brightnesses allowable under blackout conditions abroad and its accuracy is sufficient to determine compliance with legal requirements there. The observer looks through the tube at the test surface. Brightness of the comparison field, seen in the center circle of the concentric pattern, is controlled by sliding the tube over the face of the meter. The scale of this meter reads from 0.3 to 0.0002 ft.-lambert, but could be extended to 0.1 of these values by using a 0.1 setting on the voltmeter.

•

For Loosening Bushing Drain Plugs

Much time and temper has been lost in bushing repair shops in futile efforts to remove the screw plug from the hole by which an oil-filled bushing is drained. Often the screw slot is jimmied up and the plug must be drilled out. But they don't have to do this any more in the shop of the Carolina Power & Light Company. The accompanying sketch shows the simple tool devised to loosen recalcitrant plugs. The yoke is bent of $\frac{3}{8}$-in. iron bar, $1\frac{1}{2}$ in. wide. The holes in the end match holes in the bushing flange to bring the wedge-shaped piece exactly over the screw plug. This piece is free to turn on the end of a bolt screwed through the yoke. The bolt is screwed down to put the edge of the wedge into the slot of the screw plug, where it is tightened. Then the wedge is turned with a wrench. Thus the plug is loosened and may then be removed with a screwdriver.



STARTER for bushing drain plugs

•

Prevents Theft of Manhole Covers

A public utility in New York State which has experienced some difficulty in recent weeks due to the theft of

Tops personally, he and his staff are the nemesis of all incoming materials that do not measure up to Anaconda quality standards: they check them all.

In these critical days, no one can afford to make mistakes, no matter how trifling, in so vital a product as electrical wires and cables.

Relentless guard over the quality of products going into the manufacture of Anaconda wires and cables, is this "bogey man." He and his group of expert associates check every item against Anaconda's rigid specifications (tougher by far than those stipulated by government agencies), to the end that every wire and cable bearing the Anaconda name can be trusted for long, efficient, and economical service. 42244

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This familiar trade-mark symbolizes the best efforts of modern research and production.

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ANACONDA WIRE & CABLE COMPANY

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There is no getting away from it! To combat the increasing threat of sabotage, properly planned floodlighting installations leave no room for side-stepping. They become "light traps" which prevent approach to vulnerable areas—or escape from them.

Guarding the plants which make America strong is one of the many ways Goodrich Industrial Lighting serves the nation today.

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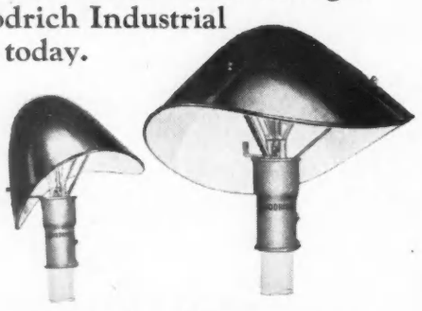
A typical Goodrich development in lighting. Provides a veritable barrier of light through which intruders cannot penetrate without immediate detection by guards or watchmen. Finished in permanent porcelain enamel and completely weatherproof. Literature on request.



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Protecting vital plants with floodlighting—saving man-hours in production—Goodrich industrial fixtures are serving America's war effort everywhere.

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manhole covers has adopted the following procedure:

Two holes are drilled opposite each other in the circumference of the manhole cover and are continued down into the rim base upon which the manhole cover rests. Then heavy bolts with hexagonal nuts are screwed into the two holes and the manhole cover countersunk so that the heads of the nuts do not protrude above the top of the manhole cover. Finally, a water-colored plastic is poured around the hexagonal nut assembly, and there has been no further trouble from the theft of manhole covers.

•

Reactive Meter "Creeping" Stopped

In a British industrial plant (J. Peacock in the *Electrical Review*) energy supplied to a battery of welders was measured by a main watt-hour meter, check watt-hour meter and a reactive meter. The latter was found to be "creeping" forward, which was disadvantageous to the customer because of a power-factor penalty. Inspection revealed that the creeping was a definite, steady, progressive motion from all positions of the disk. The rotation was in no way characteristic of an intermittent creep motion. The plant electrician pointed out that possibly the current transformers and meter series coils had been damaged when recently an apprentice had caused a heavy short-circuit by dropping a length of wire across the terminals of the main circuit breaker.

The breaker was found to be closed and fitted with a no-voltage release. The solution of the creeping problem then became clear. The current taken by the breaker no-voltage release was passing through the meters, lagging the voltage by a large angle due to the inductance of the solenoid coils. When resolved into its constitutent components the current gave a small power component in the main and check watt-hour meters and a relatively large one in the reactive meter. The inphase current was less than the starting value for the cosine instrument, while the reactive current was responsible for the mysterious creeping of the sine meter.

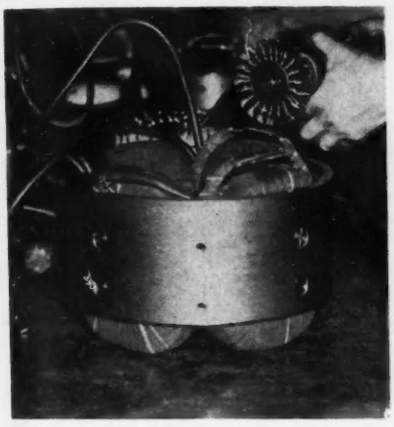
Correction was effected by installing a small, permanently connected condenser, which would not cause re-

verse rotation of the reactive meter when the breaker was opened at night, since a ratchet in this meter prevented backward movement.

•

Power Brush Cleans Connections Fast

Clean contact surfaces are essential to good electrical connections. Scraping or sand-papering such surfaces does not thoroughly clean them and, besides, uses up time and elbow grease. A better way is to employ a power-driven wire brush as is illustrated in the accompanying picture



WIRE BRUSH cleaning motor field connections

showing a 4-in. power brush being used to clean field magnet connections of industrial truck motors in the plant of the Elwell-Parker Company.

The disk-center wire power brushes, supplied by the Osborn Manufacturing Company, have permitted greatly increased speed in this particular operation over the formerly employed hand method of cleaning. The average size field magnet is now cleaned in approximately 60 seconds by the power brush; previously, by hand scraping, it required fully five minutes.

Field magnets for industrial trucks are produced at the rate of about one an hour by the firm and range in sizes from approximately 6 in. diameter to 20 in. or larger on special jobs. As used by the Elwell-Parker Company, two brushes, joined together, are found to give the best cleaning of the copper field leaves' ends. They are clamped together by a bolted nut arbor and are easily fitted on the electric drill.

FEDERAL

ELECTRIC PRODUCTS

at this point

THE "SAFETY SWITCHMAN" CARRIES THE LOAD

In Federal Panelboards, the "Safety Switchman" is an ingenious switch that stands constant watch ahead of every fuse. This means a higher safety factor and perfect control protection of lighting and small power circuits. Federal Type NTPR Panelboards—to handle from 4 to 40 circuits—are compact, ruggedly built, and approved by Underwriters Laboratories. They have quality construction features that you'd expect would cost considerably more. *For complete Federal panelboard specifications, write for Bulletin No. 21-40.*

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Solderless Terminal Connectors • Rugged Construction
Giant Switches • Low Cost

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.

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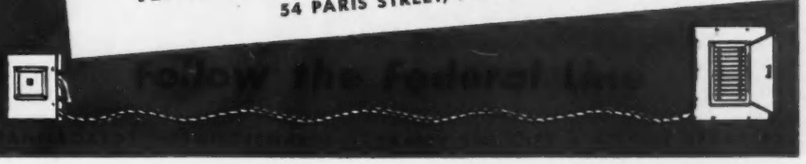
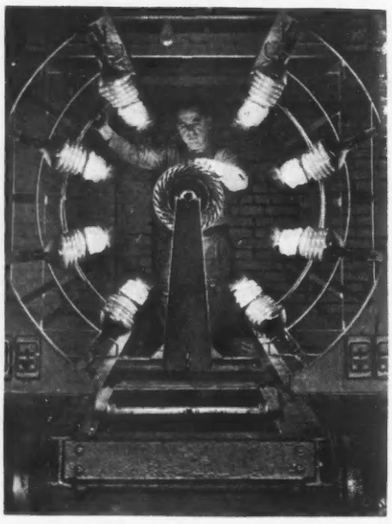


LOAD SERVICING

Industrial • Commercial • Rural • Residential

Time for Armature Baking Cut a Third

Radiant drying lamps, replacing steam heat, have reduced the drying time for 12-in. armatures from 18 to five hours in a small industrial repair shop; 120 infra-red Westinghouse 250-watt reflector drying lamps (type R-40) are arranged in tubular form in two equal adjustable banks.



INFRA-RED HEAT bakes armatures quickly

Three 10-kw. sections, each consisting of eight groups of five lamps, permits three armatures to be baked simultaneously or individually. Heating temperatures range between 240 and 260 deg. F., as compared to 185 to 200 deg. F with steam heat. Drying time varies from three to nine hours for armatures from 6 to 24 in. in diameter. Power supply is single phase, three-wire with individual 30-amp. switches controlling the 24 five-lamp groupings, a total load of 30 kw.

The wall construction of the old steam oven remained intact in the revamping. The only changes made were the removal of the steam pipes, the doors and the venting in the roof. Each bank of lamps is supported from the roof on barn door slides, which permits the lamps to be adjusted to the proper distance of 7 in. from the armature surface.

•

Adopt Bi-Monthly Meter Reading Plan

A two-month meter reading schedule, with bills rendered monthly, was inaugurated June 1 by Consumers Power Company, Jackson, Mich. The bi-monthly reading plan was adopted to conserve truck and car mileage and meet the steady exodus of meter readers to war industries and the armed forces.

Interim bills are estimated, by commission order, on the basis of the average of the previous two months' bills. The amount paid on the interim (estimated) bill is handled as a cash credit against the bill rendered from the actual bi-monthly meter reading. In figuring the bill for a two-month period, from a rate designed for monthly billing, the energy blocks of the rate are doubled. Thus, instead of 15 kw.-hr. at 5 cents the block becomes 30-kw.-hr. at 5 cents. Extensive studies show that the amount of error involved in calculating bills in this manner is negligible.

Customers insisting that bills be rendered from actual readings are provided with return postcards. These have spaces for customer's name, address, meter number and dials for indicating position of the register hands. Day of the month on which these cards must reach the billing department is also shown.

The plan applies to rural, residential, commercial and small industrial customers. However, where commercial and small industrial meters can be read "on foot," as would be the case in congested districts—they are read monthly. Residential meters, on the other hand, are read bi-monthly, even in cities.

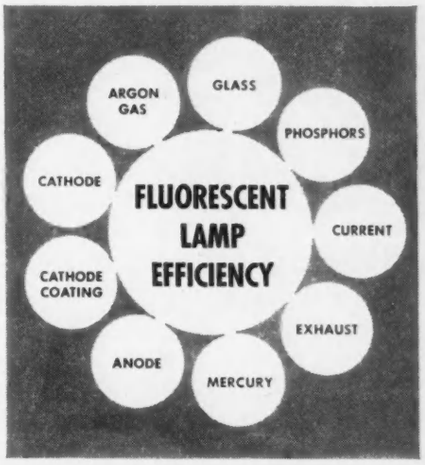
Customer inquiries and comments regarding the meter reading plan were carefully studied in the early phases of the plan. Analysis of 351 inquiries received during the first month of operation in Kalamazoo, where 42,000 bills are rendered monthly, follows:

331—Wanted to know if they would be billed every two months.
1—Thought the new plan a good idea.
1—Asked if rates were to be reduced.
3—Had just used a large amount of energy and "hated" to have bills estimated on that basis.
1—Refused to be billed on estimated use; said would pay only for actual reading.
1—said only benefit of plan is to make more money for company.
2—Can't see saving in car mileage since meter reader walks anyhow.
2—Said company can do this now, but will regret move when conditions change.
2—Commented that two-month bills would save customers' cars.
1—Industrial customer said didn't think company would save any money—wanted previous reading indicated on bill.
3—Didn't like bill without previous reading; couldn't distinguish between power and light.
1—Objected that plan put some people out of work.
1—Thought estimated bill too high—satisfied by explanation.
1—Commercial customer thought plan "hocus-pocus"; no real complaint, just didn't like idea.

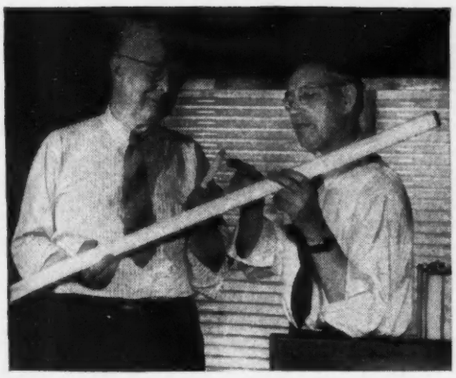
The number of meter readers re-

The Story Behind MORE LIGHT *for* LESS COST

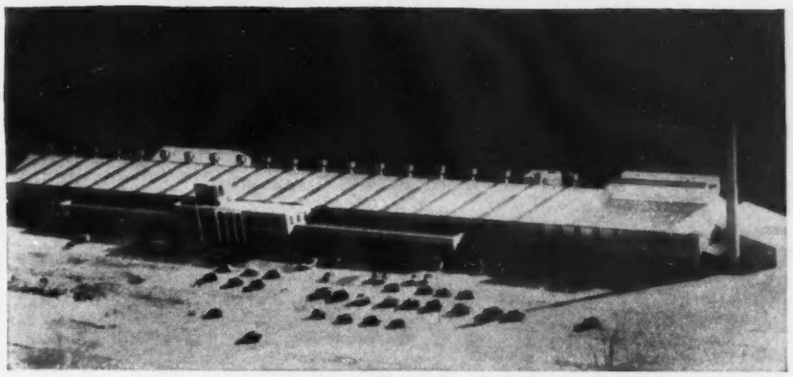
G-E research constantly seeks the best possible combination of all factors affecting lamp efficiency. Here are nine of the most important. There are more than a million possible combinations of these factors. It's the task of G-E research to find the *best* possible combination!



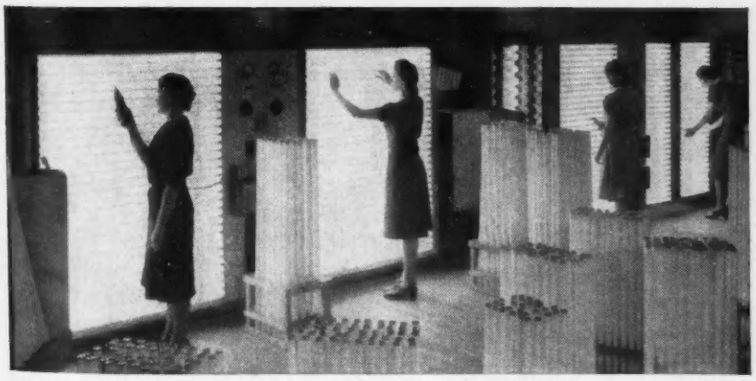
All materials are tested with extreme care. Here, we check the brightness of phosphor powders that coat the inside of fluorescent lamps to make sure that you get maximum performance from your G-E MAZDA F lamps.



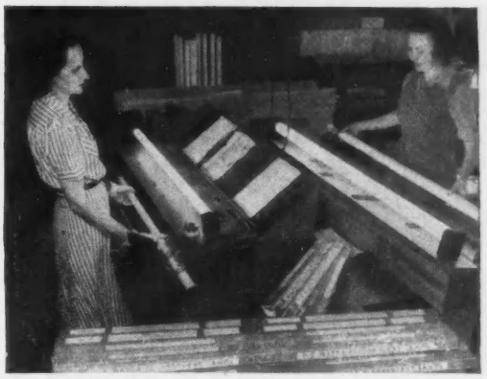
Experience counts. W. L. Enfield (left) and P. J. Pritchard have been active in directing research for better product and lower prices.



Here is one of the new streamlined, specially designed G-E fluorescent lamp factories that have helped materially in reducing costs. Sand for glass tubes comes in at one end. Finished lamps are shipped from the other.



Constant testing guards the quality of G-E MAZDA fluorescent lamps. At every stage in the manufacturing process, General Electric inspections provide safeguards of quality. Above, G-E MAZDA lamps are inspected while undergoing a "seasoning" process on the test racks.



Extra assurance of quality is a series of over 50 tests and checks on completed lamps by MAZDA SERVICE inspectors, who work under the direction of an independent testing laboratory.

Mr. Wartime Lighting Counselor:

WAR PLANTS GET THE LIGHT THEY NEED---WHEN YOU *Plan and Specify*

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You are performing a tremendous service for America by helping get the utmost production out of War Plants with the aid of better lighting. Your plans are carefully developed and properly engineered. By specifying Guth Engineered Fixtures, you insure ultimate lighting results from your layouts.

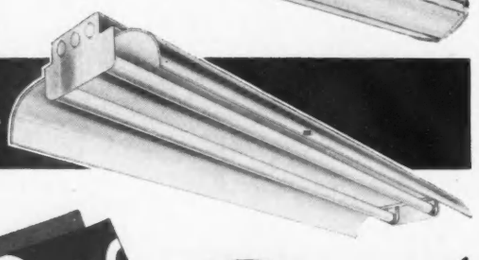
Our 40 years of experience have built quality and dependability into every GUTH Fixture—and our production methods meet today's demands for prompt shipment on orders of 1 to 1000 units.

Write for New Literature to get better acquainted with GUTH Products.

For FACTORIES. GUTH Engineered Fluorescent provides quick, easy seeing for accurate work. In the installation pictured at left, color matching and close inspection are quickly and successfully done under 30-32 foot-candles at floor level.

For OFFICES AND DRAFTING ROOMS: It's equally important to have good lighting where production is started and controlled. There's a GUTH Unit for every need. In the installation below, shadows are minimized; and in spite of the low mounting level, direct glare is practically non-existent.

Non-Metallic Reflectors Save Vital War Materials



The new GUTH Masonite reflector is made of pressed-wood instead of steel, releasing tons of metal for war equipment! The larger "reflector-mouth" and GUTH "300° white" enamel finish produce greater light-output.

FORTIETH YEAR OF Guth LIGHTING LEADERSHIP

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

quired to handle the company's 719,000 gas and electric meters has been reduced from 136 on June 1 to 100 in July. When the remaining two of the fifteen company divisions adopt the program it is expected that the number of meter readers required will be reduced to 92. This rate of reduction in the number of meter readers closely parallels the loss of meter readers to industry and the armed forces.

The company bill form has been changed slightly. Stamps on the bill form explain that meters are read every two months and interim bills estimated on previous use. Attention is called to an inclosed mailing piece explaining the new plan in more detail.

Where customers object to the amount of the estimated "interim" bill the matter is adjusted to the customer's satisfaction and the amount so agreed upon is credited against the bill to be rendered from next reading.

•

Laundry Produces Bleach Electrolytically

Progress has been made on the part of Seattle laundries in the direction of producing their own chlorine for bleaching purposes, by electrolysis. The Puget Sound Power & Light Company reports that at least two large laundries, faced with shortage, have now placed themselves on a "self-sustaining" basis in this respect, with others seriously considering the step.

One of these installations, in a large downtown laundry, is typical. Introduced as a protective measure, the company finds now that all the necessary bleach is produced at less cost than when it purchased the bleach on the market.

As explained by Lloyd Steele, industrial representative of the Puget Sound company, Valhalla equipment of the regulated flow type is employed, in the construction of which practically no steel is used. There is a 100-gal. wood tank mounted 5 or 6 ft. above the floor. This receives the charge of salt and water, which is mixed in about five minutes by means of a simple, manually operated agitator. Below the main tank is a smaller one with float control from which the solution is fed to the electrolytic cells at practically no head, so that the cells

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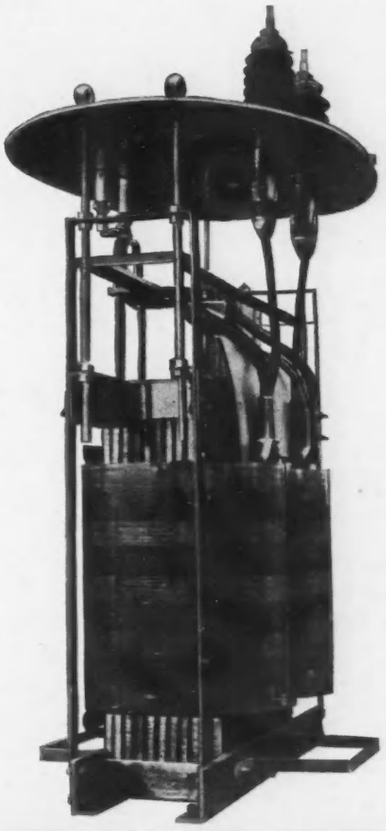
UNDER ALL OPERATING CONDITIONS

4000 K.V.A. Uptegraff Power Transformer. One of a group recently designed for vital Defense Work.



The war has uncovered many new power requirements which prove anew the versatility, adaptability and dependable performance, under even the most daring emergency operations, of Uptegraff Power Transformers.

Our standard types and sizes will serve efficiently in most instances. Where special problems are presented Uptegraff engineers are at your service.

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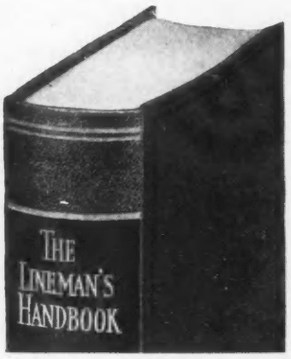

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10. Tower-line Erection
11. Inspection, Testing, and Maintenance
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13. REA Manual of Operation and Maintenance
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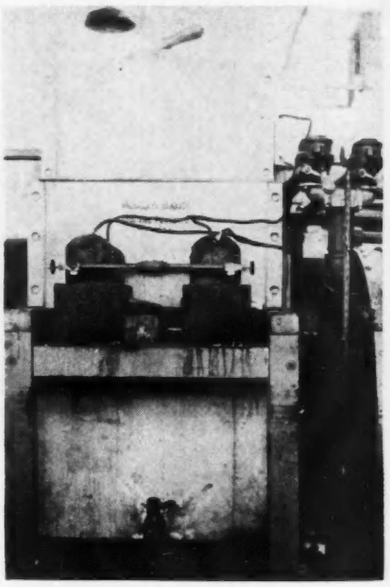
are not flooded. The solution flows through the cells and then into a receiving tank, from which it is taken to be mixed with the water in the washers.

There are two cells, connected in parallel, each containing thirteen carbon electrodes. Ninety volts pressure is applied across the cells, producing 32 amp. of current flow through the brine electrolyte. The chlorine produced in the break down of the NaCl molecule remains in solution, which in this case represents one-half of 1 per cent chlorine. This water and



ELECTROLYSIS EQUIPMENT for local production of laundry bleach

chlorine mixture is then mixed with the washing water in such proportions as are necessary to meet the bleaching requirements of each washing machine batch.

The electrical equipment involved in this instance consists of a motor-generator set obtained from a local machinery house. It embodies a G.E. 125-volt 45-amp., direct-current generator directly driven by a 10-hp. G.E. 120-volt, three-phase motor through a Morflex coupling. This general type of unit can be secured and assembled, together with the moderate amount of switching and wiring equipment, without too much difficulty from the resources of local stocks.

To make 100 gal. of one-half of 1 percent bleach takes about three hours. The plant superintendent has kept detailed cost figures and has found that, considering cost of salt,

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TRANSFORMERS
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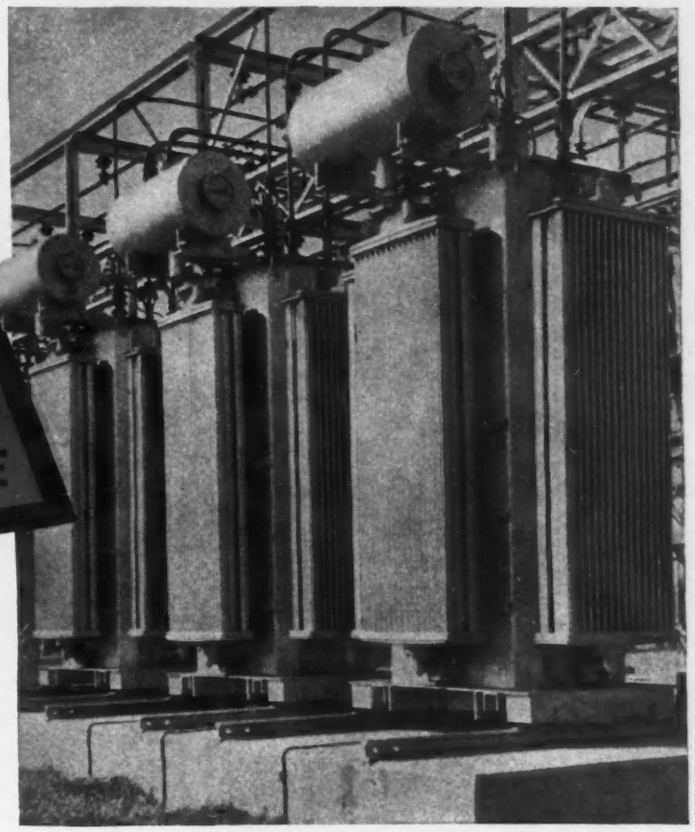
DEPENDABLE PERFORMANCE



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The power industry must "carry the load" and be ever ready to serve users with absolute dependability.

Transformers are the essential links in power distribution and they must be able "to take it" – they must be able to stand up under the heavy loads imposed upon them by industry today in its "all-out" effort to "beat the promise."

Wagner transformers are built to give dependable performance under the most severe operating conditions and fit right into the needs of the power industry. Every Wagner transformer has the benefit of more than 50-years of transformer engineering experience... experience in building all types and sizes of transformers. No matter how varied your requirements, Wagner transformers will do the job. Specify Wagner transformers on your next request for quotation.

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★ MOTORS
★ FANS
★ BRAKES

RUBBER COVERED POWER CABLES • BUILDING WIRE • VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

Every Man, Woman & Machine
at
CRESCENT

is working 100% to keep the Light of Freedom burning!

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER • AGING INSULATION

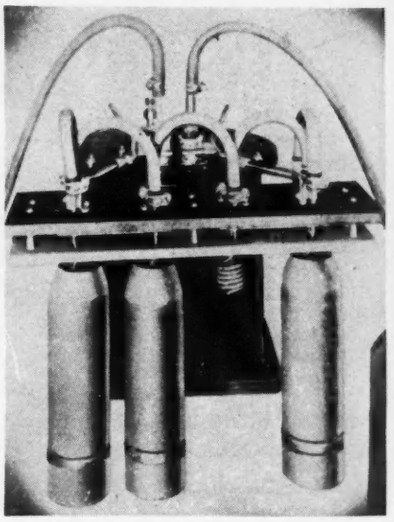
electrical energy and labor, the total cost of 100 gal. of such bleach is 82½ cents, as contrasted with $1.95 for the same amount of the same solution strength when the bleaching agent is purchased.

•

Raise Shell Output With Inductive Heat

In the modification of 75-mm. shells for a revised nose fitting it was found that the tap and chaser life was exceedingly short. Investigation showed the trouble to be caused by hardened shot from a shot-blasting operation lodging in the threads and interfering with the thread chaser action.

In order to relieve this condition it was necessary to heat the inside of the nose to annealing temperature

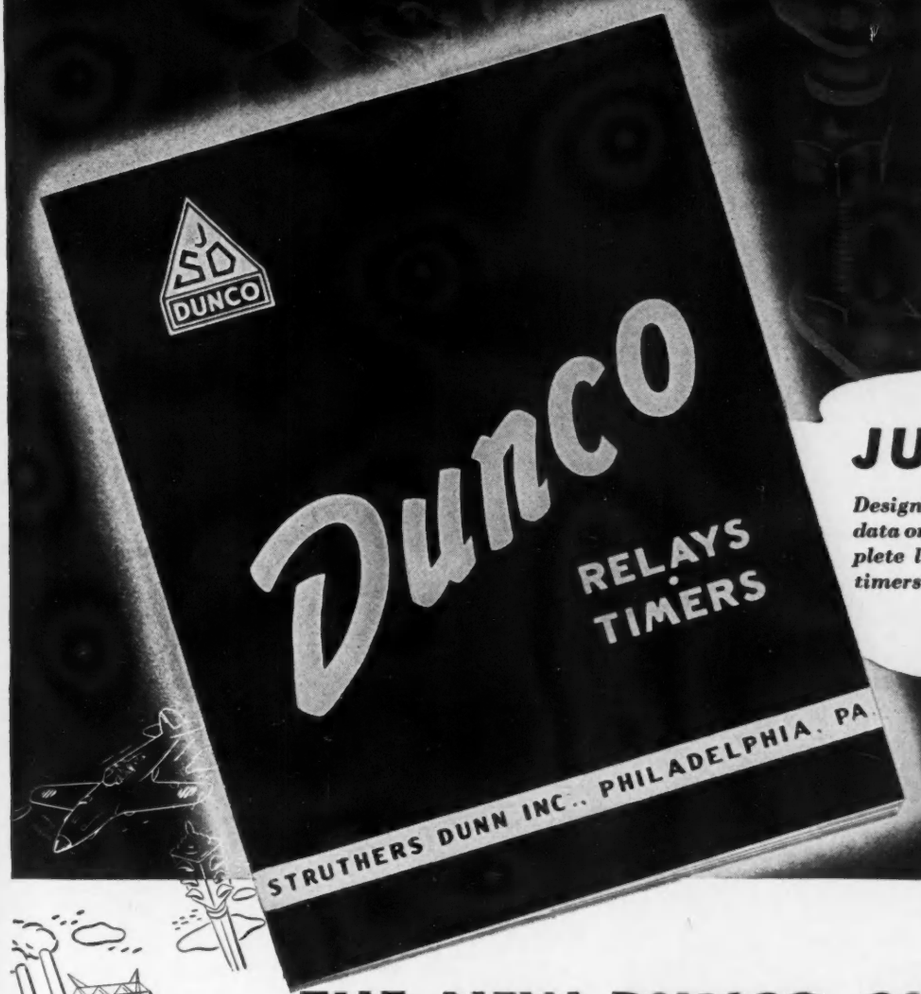


HIGH-FREQUENCY heating facilitates threading shells for nose fitting

without having the heat penetrate the metal and change its physical characteristics. This was done with a high-frequency heating device with coils specially designed to fit into the noses of the shells. Energy is supplied from a Thermonic induction generator.

One of the features of this particular job is the ease and simplicity of its operation. Heating is applied instantly by push-button control. A continuous flow of production is possible at the rate of approximately 280 units an hour. Skilled labor is not necessary. After the preliminary set-up no adjustment is necessary—the operation is automatic. The temperature is controlled exactly to the desired area with no annealing beyond.

WRITE FOR YOUR COPY TODAY!



JUST OUT!

Design, engineering and catalog data on the nation's most complete line of quality relays and timers including many types for war requirements.

THE NEW DUNCO CATALOG AND RELAY-TIMER DATA BOOK

• Far more than a catalog, the new Dunco Relay-Timer Book is a complete guide to relay selection and usage. Fully revised, greatly enlarged, profusely illustrated, replete with detailed specifications and engineering information, and prepared with a particular eye to war equipment requirements, it is a book that should prove helpful to designers, engineers, purchasing agents, production executives and maintenance men alike.

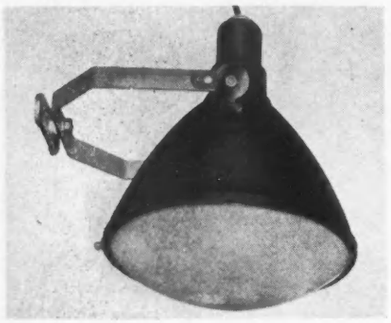
Write for your copy today—or as many copies as may be required to equip your organization. Please mention company connection.

STRUTHERS DUNN, INC., 1319 CHERRY STREET, PHILADELPHIA, PA.

NEW EQUIPMENT

Floodlights

This is a new line of inexpensive, lightweight, weathertight, porcelain enamel floodlights for general and protective light-



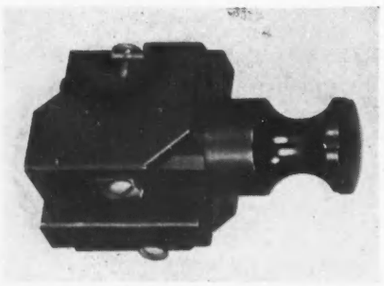
Types E-8, E-12, E-14 and E-16 universal floodlights for lamps from 75 to 1,000 watts. **Lighting Division, Westinghouse Electric & Manufacturing Co.**, Edgewater Park, Cleveland, Ohio.

ing of homes, farms and industrial plants. The E-8 and E-12 are suggested for lighting street repair work, driveways, garages and plant entrances. The two larger units were particularly designed for floodlighting industrial plants, construction projects, freight terminals and docks.

•

Pull-Push Control Button

Greatly increased safety and economy are claimed as features of this new line since a single button for both starting and stopping is a natural thought. Point of reset is in the center, requiring intentional pull to start. Since to push is to stop, the motor "fails safe" if button is accidentally hit.



Safety pull-push button line, heavy-duty interchangeable units. **The Arrow-Hart & Hegeman Electric Co.**, Hartford, Conn.

Plastic Insulator

Plastic sleeves to replace rubber on Mueller Universal Clips. **Mueller Electric Co.**, 1583 E. 31st Street, Cleveland, Ohio.

These new plastic insulators were developed to conserve rubber. They are stated to be dependable, really tough, of high dielectric strength and strongly resistant to heat and oil. The clip is securely housed in the insulator, which will not slip back on the wire.

•

Fire Extinguisher

"Whippet," fire-extinguishing powder, packed in 10- and 40-lb. cans for industrial use, also in 2½-lb. containers for home use. **Halco Chemical Corp.**, 551 Fifth Avenue, New York, N. Y.

In tests this new powder is said to have put out the fire caused by an incendiary bomb in a matter of seconds. No equipment is required; powder is simply thrown on the fire by handfuls. Stated to be nonpoisonous and to release no noxious gases.

•

Standard Testing Panels

Factory-assembled panels for production and research testing. **Standard Electrical Time Co.**, Springfield, Mass.

Designed and built to user's requirements, it is stated that these panels can be promptly delivered with high priority ratings. No catalog available; each order treated as an individual design for the particular case.

•

Lighting Fixture

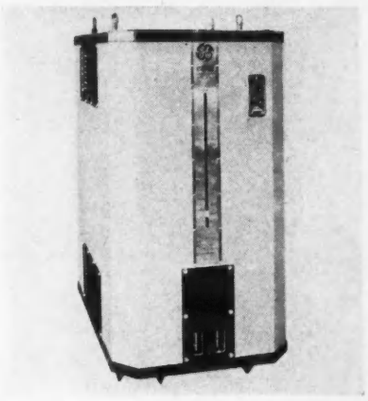
"Asbestolite," flame-proof fluorescent lighting fixture of moulded asbestos. **Century Lighting, Inc.**, 419 W. 55th Street, New York, N. Y.

This substitute for steel lighting fixtures is designed for use in industrial plants engaged in war production where complete fire resistance is required. The fixture has been approved by the Underwriters' Laboratories.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Welding Transformer

New heavy-duty alternating-current welding transformers especially designed for Unionmelt welding are available in 750-



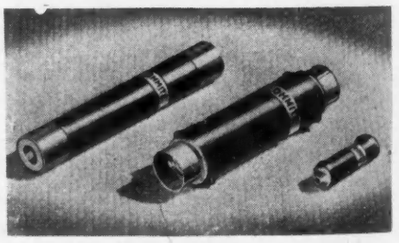
G-E welding transformer for Unionmelt welding. **General Electric Co.**, Schenectady, N. Y.

and 1000-amp. sizes (NEMA) for 220-, 440-, and 550-volt power. Transformer has built-in capacitors and features built-in primary control, advantageous in portable installations because of its compactness. Motor-operated, remote adjustment of welding current permits operator to make current adjustments without leaving the work. Inorganic insulation throughout.

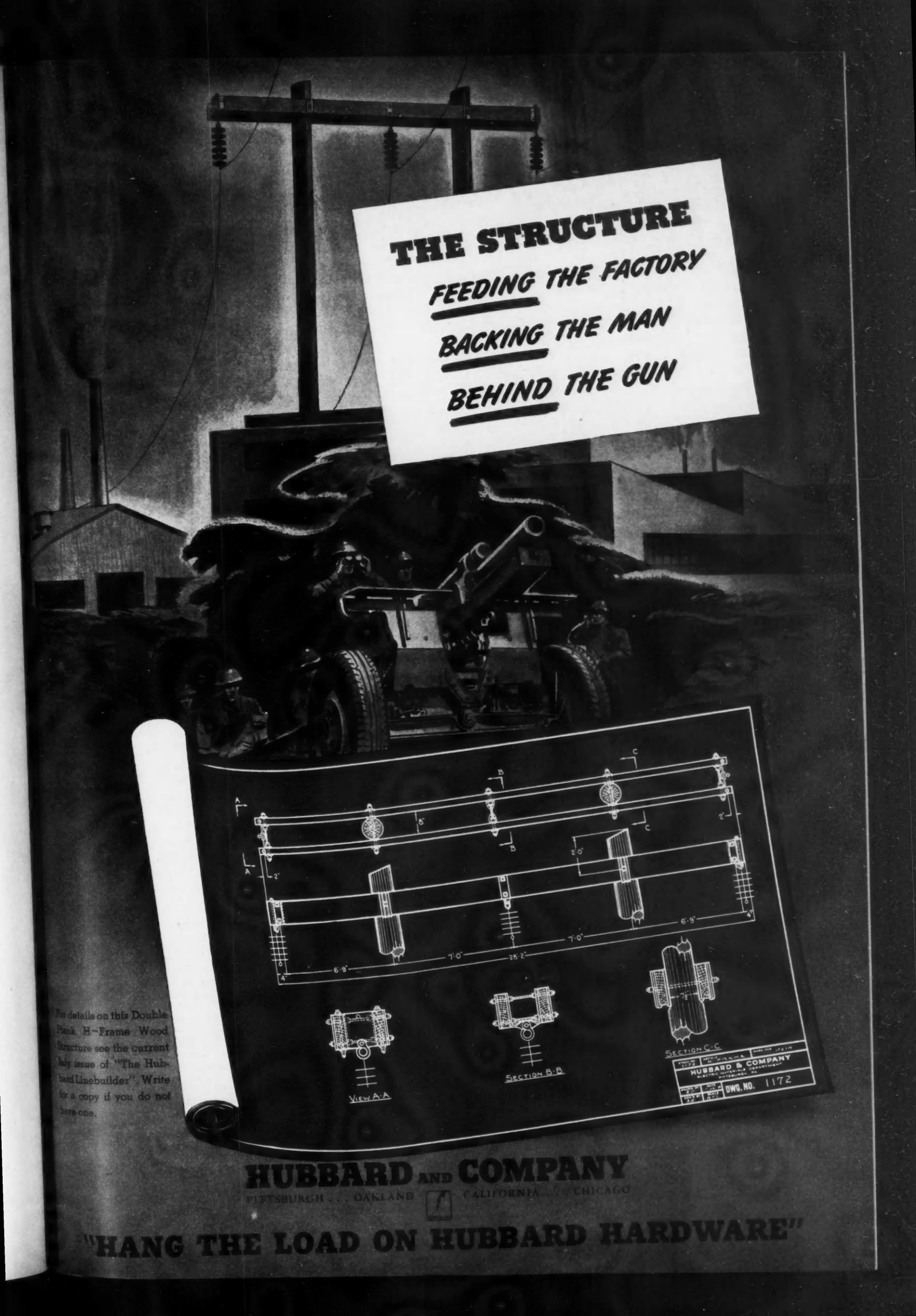
•

Resistors

Easily interchangeable resistors with resistance wire wound on a ceramic core and covered by a vitreous enamel coating. Regular coating is said to withstand repeated heat shock tests and special coatings to pass salt water immersion tests are available. Wide range of sizes.



Ohmite ferrule resistors for mounting in fuse clips. **Ohmite Manufacturing Co.**, Department 2 E, 4835 Fluornoy Street, Chicago, Ill.



For details on this Double Plank H-Frame Wood Structure see the current July issue of "The Hubbard Linebuilder". Write for a copy if you do not have one.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND . . . CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

BY-PASSES FOR "GROWING PAINS"!

Expert piping services by Grinnell speed up war-plant expansions.

Whenever *piping* plays a part in plans to increase wartime production, Grinnell's experience and facilities can help you "by-pass" needless delays and exacting detail work.

All you do is "give the plans to Grinnell". Grinnell does the rest . . after interpreting the requirements, underwriter-approved sub-assemblies like the one shown are prefabricated in minimum time and delivered ready for fast installation.

Today, Grinnell has stepped up its facilities to handle war requirements *faster*. "Whenever piping is involved", call on Grinnell for pipe prefabrication; automatic sprinkler fire protection; cast iron, malleable iron or welding fittings; pipe hangers; heating specialties; or humidification systems.

Write for specific information on these services. Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of U. S. and Canada.

Grinnell Company, Inc. • *Grinnell Company of the Pacific* • *Grinnell Company of Canada, Ltd.*
General Fire Extinguisher Company • *American Moistening Company*
Columbia Malleable Castings Corporation • *The Ontario Malleable Iron Company, Ltd.*

TECHNICAL LITERATURE

LOW TEMPERATURE WELDING—A 4-page folder illustrating tool salvage jobs through the use of Castolin eutectic welding alloys. Typical repair costs are given for drills, reamers, milling cutters, saws and broaches, using the oxy-acetylene torch. Machine part salvage is mentioned. Table of Castolin alloys adapted to various jobs with steel and non-ferrous metals, tensile strength data and notes on color match. Obtainable from Eutectic Welding Alloys, Inc., 40 Worth Street, New York City.

ROTARY BLOWERS—Description and data upon positive displacement blowers for use in scavenging and supercharging diesel engines, in water works and treatment plants, chemical process industries, pneumatic conveying systems, oil refining, coal treatment, food industries, tunnel ventilation, etc., 20-page bulletin reviews basic principles and contains characteristic curves of operation, specifications and table of standard ratings for pressures up to 10 psi. Roots-Connersville Blower Corp., Connersville, Ind.

RECTIFIERS—How backfires start and the circuit and oscillographic explanation of prevention by high-speed circuit breakers between transformer and each anode is discussed in a 4-page technical bulletin (No. 4205) of I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia, Pa.

CALCULATOR—Guy calculator having rotating disk on 4x7-in. card is designed to determine what anchors to use and where to use them to get the desired results. It is available to any one who can actually put it to use and may be obtained from Utilities Division, A. B. Chance Co., Centralia, Mo.

UNDERVOLTAGE—Condensed examples of voltage correction to improve lighting performance and motor operation in war industries through the use of regulators are given in a 16-page bulletin, G.E.S.2,973. Figures on the adverse effects of subnormal voltage are presented, with emphasis upon maintaining war material production. Available at General Electric Co. offices.

SILVER ALLOY BRAZING—Detailed procedure in brazing fabricated copper piping with silver alloy is covered in an 8-page bulletin prepared by J. C. Powers, Jr. and H. DeM. Lucas. Diagrams are included. The alloy used is known commercially as "Easy-Flo No. 3" and conforms to Navy Specification 47S13 Grade V. It is maintained that such work can be done even by inexperienced men after seven to ten days' training. Available from Handy & Harman, 82 Fulton Street, New York City.

HOME LIGHTING IN BLACKOUTS—Practical 16-page booklet filled with information on simple methods of keeping blackouts outside the home and maintaining morale during air raids. Written by Myrtle Fahsbender, director of residential lighting at Westinghouse, the booklet (A-4103) lists materials, costs, dimensions, methods of making up economical shades, selection of proper lamp sizes and care of domestic lighting equipment. Importance of adequate light emphasized. Can be obtained at 5 cents per copy with accompanying lecture notes on the subject, if desired, from Westinghouse Electric & Mfg. Co., Bloomfield, N. J. Lantern slides are available free of charge.

Inspection *before* extrusion—the one sure way to guard against flaws entering the finished tube

Wolverine extrusion press in operation

That's why every Wolverine Condenser Tube billet must pass this exacting test

The high uniform quality of Wolverine Condenser Tubes has been proved in actual service.

These superior tubes are made by the extrusion process, and a decisive step in maintaining Wolverine quality is the final inspection given each billet *before* it enters the extruder.

At Wolverine, we literally "take the hide off" every condenser tube billet. This "scalping" results in the quick detection of any surface flaws that may extend beyond the shaved surface.

Each billet as cast is cut six or seven times into smaller extrusion blocks. This means that with every billet, we examine the cross section at each of these points to make sure that no center piping or porosity exists in the metal. These two inspections make sure that there are no flaws within the billet or in the exposed surface.

This Wolverine Inspection-before-Extrusion Process takes more time, costs more money—but it is the only sure way to guard against casting flaws which would be invisible in the finished tube. This process insures that we throw out faulty billets here rather than having condenser tubes fail on your job.

So it will pay you to consult with Wolverine engineers regarding your next condenser tube installation.

WOLVERINE TUBE DIVISION

OF CALUMET AND HECLA CONSOLIDATED COPPER COMPANY

Seamless COPPER · BRASS · ALUMINUM

1427 CENTRAL AVENUE · DETROIT, MICHIGAN

NEWS ABOUT PEOPLE

F. A. Tracy Elected Head of Sierra Pacific Co.

Frank A. Tracy has been named president of Sierra Pacific Power Co., Reno, Nev., to succeed the late H. A. Lemmon. Mr. Tracy, who has been associated with the utility industry for 23 years, was manager of Sierra Pacific previous to the promotion.

Following graduation from the University of Maine in 1919, he took a position with Stone & Webster Co. in the Boston statistical department. Later he spent two years with the Ponce Electric Co. in Ponce, Puerto Rico, as assistant superintendent of distribution.

From Puerto Rico he went to Pawtucket, R. I., where he remained for twelve years, serving in various capacities. He was assistant to the president when he left to take a position with the Sierra Pacific Power Co. in Reno.

•

▶ R. S. RAGAN, superintendent of the Bridgewater plant of the Duke Power Co. since it was built, retired recently after 35 years of service. Mr. Ragan began work for the utility in 1907. He was in charge of the substation at Salisbury for seven years, and in 1915 was made superintendent of the Rock Creek plant at Great Falls, S. C. In 1918 he went to Bridgewater to supervise installation of equipment and machinery. J. B. CURTIS, assistant to Mr. Ragan for 22 years, has succeeded him as superintendent of the Bridgewater plant.

▶ WILLIAM A. HOLT, vice-president of Bullock's and president of the California Retailers' Association, has been appointed a member of the Los Angeles Municipal Water and Power Commission. Mr. Holt fills the vacancy created by the death of Clinton E. Miller.

▶ W. B. HOWARD, for seventeen years connected with the Duke Power Co. in Winston-Salem, N. C., has been placed in charge of the company's Madison branch, to succeed Clarence Brown, who recently received his commission as a naval lieutenant.

▶ JOHN W. FITCH, for the last eight years an engineer with the Federal Power Commission, has transferred to a similar position with the Export-Import Bank of Washington, a Reconstruction Finance Corp. subsidiary. Mr. Fitch joined the FPC staff in January, 1934, as part of the National Power Survey staff. For the last two years he has been a principal engineer in the commission's defense staff.

▶ WALTER DOOLITTLE, first power salesman employed by the Kansas City Power & Light Co., recently retired after approximately a quarter century of service. It was back in 1904 that Mr. Doolittle became identified with the utility as a "solicitor" in the power branch of the business. By 1905 he was in charge of the power sales department. In 1911 Mr. Doolittle left Kansas City for Cuba where he was in business until 1918. The following year he returned to Kansas City Power & Light, where he has been engaged in the sale of service, power and equipment through the succeeding 22 years.

Roy M. Smith Joins Roller-Smith Staff

Roy M. Smith has joined the Roller-Smith Co., Bethlehem, Pa., as assistant chief engineer. Mr. Smith was formerly identified with the Bryant Electric Co., where he was engineering manager for the wiring device division. Prior to this connection he was with the Westinghouse Electric & Manufacturing Co. as section engineer on relay design and application.

A graduate of the University of Washington, Mr. Smith has been active in the American Institute of Electrical Engineers for a number of years. He is the author of several articles which have been published in ELECTRICAL WORLD and other technical publications.

Mr. Smith will devote the major part of his time to design and application of the company's products.

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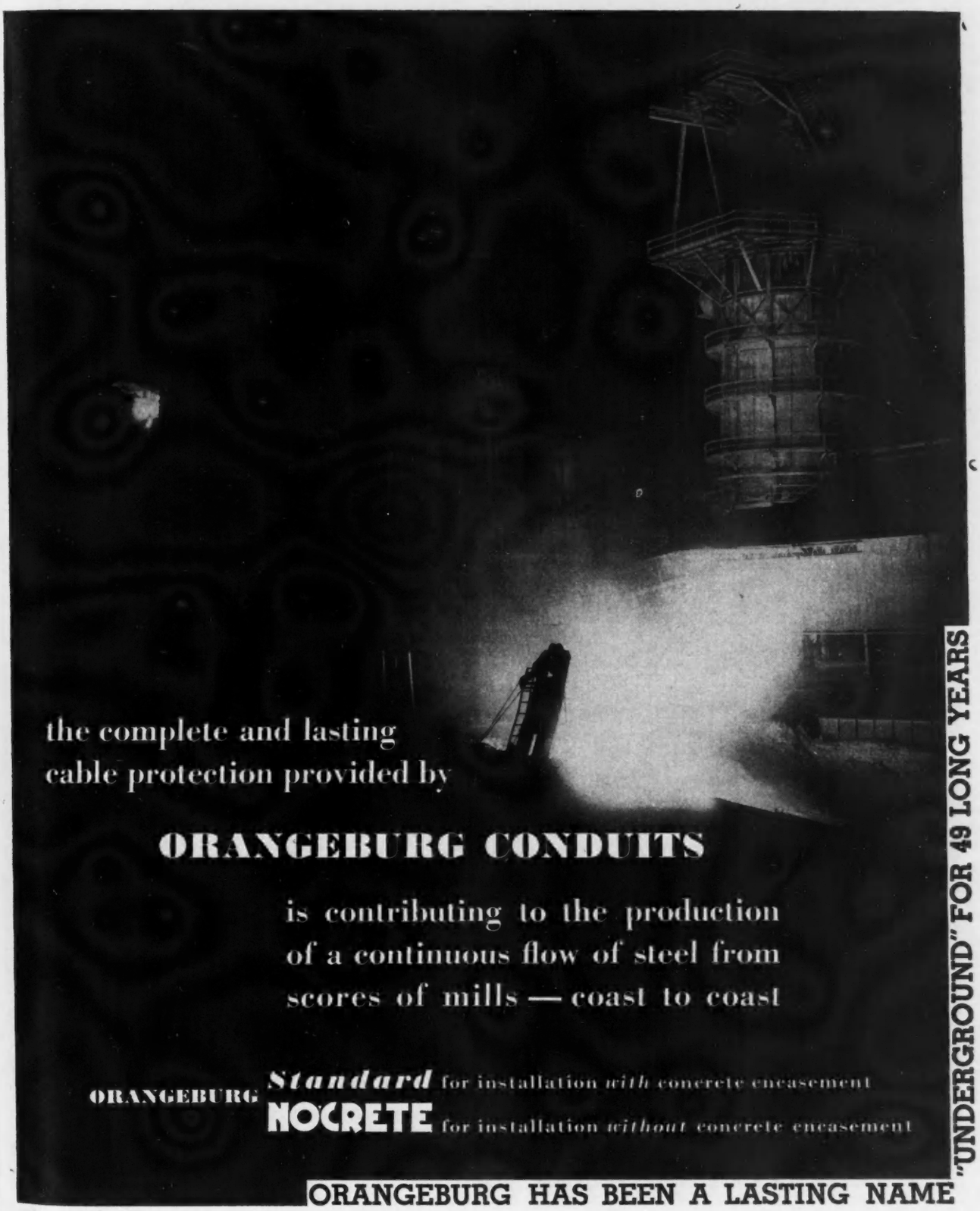
▶ W. H. STUEVE, in charge of sales to the petroleum industry, Oklahoma Gas & Electric Co., has been asked to serve as power consultant for War Emergency Pipelines, Inc., of Little Rock, Ark. Mr. Stueve will remain with the project


the complete and lasting
cable protection provided by
ORANGEBURG CONDUITS
is contributing to the production
of a continuous flow of steel from
scores of mills — coast to coast
ORANGEBURG Standard for installation with concrete encasement
NOCRETE for installation without concrete encasement
"UNDERGROUND" FOR 49 LONG YEARS

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Build for tomorrow with

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GENERAL ELECTRIC SUPPLY CORP.
(and associated houses)

GRAYBAR ELECTRIC CO., INC.
(offices in principal cities)

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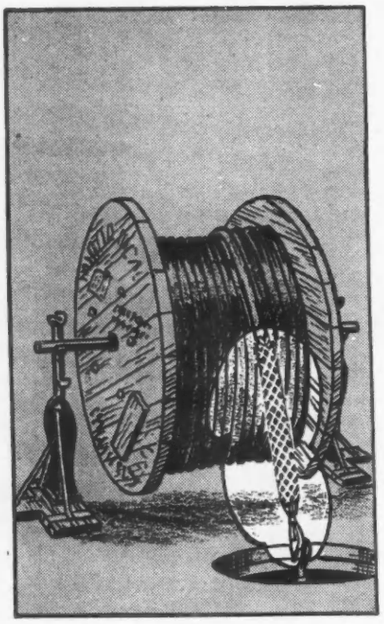
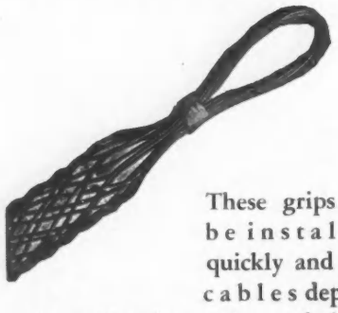
SPEED

CONSTRUCTION and EXPANSION of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable



These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because the wires pull with evenly distributed load. Eight different styles — all supplied in a full range of sizes.

Reliable ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 GARROLL AVENUE - CHICAGO ILLINOIS

until the electric power matters have been concluded.

▶ DAVID DUNN, assistant engineer on the Oregon Public Utilities Commission, has been appointed chief engineer to succeed T. O. RUSSELL, who has entered the military service with the Army Engineers. Mr. Russell has been granted an indefinite leave of absence. He was chief engineer of the commission for the past eight years.

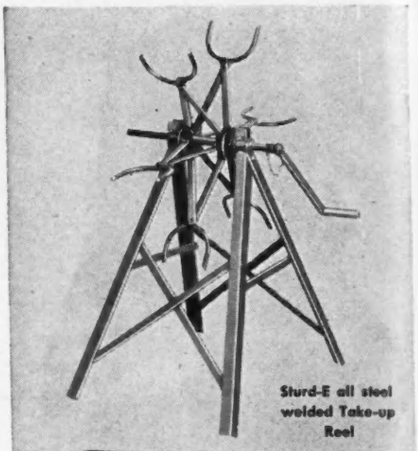
▶ WALTER GIBSON, of the advertising department of the Swartzbaugh Manufacturing Co., Toledo, Ohio, has been elected secretary and treasurer of the Toledo Industrial Marketers Association.

▶ HAROLD L. ROWLAND has been appointed to the administrative staff of Carrier Corp., Syracuse, N. Y. Mr. Rowland is resigning as president and director of George F. Getty, Inc., and also as vice-president, treasurer and director of Pacific Western Oil Corp. and as vice-president and director of Mission Corp. to assume his new duties.

▶ D. D. EWING, professor of electrical engineering, Purdue University, Lafayette, Ind., has been appointed head of the school of electrical engineering and director of the electrical laboratory. He has been connected with the staff at Purdue since 1913. Since 1910 Dr. Ewing has been a consulting engineer. He is a fellow of the American Institute of Electrical Engineers and a member of the Society for the Promotion of Engineering Education.

▶ W. R. WORK, head of the electrical engineering department, Carnegie Institute of Technology, Pittsburgh, Pa., has been appointed assistant director of the college of engineering. He was identified with the Westinghouse Electric & Manufacturing Co., East Pittsburgh, before joining the teaching staff of the Carnegie Institute in 1906. In 1921 Dr. Work was made head of the department of electrical engineering. From 1921 to 1930 he also maintained private practice as a consulting electrical engineer. He is a fellow of the American Institute of Electrical Engineers and a member of the American Association for the Advancement of Science and the Society for the Promotion of Engineering Education.

▶ CHARLES J. SPIEGEL, installation engineer for the General Electric Co., has retired after 43 years of continuous service with the company. He has supervised installation of more than 1,500,000 kw. of hydro-electric generators for the company in a number of foreign countries as well as in the United States. Mr. Spiegel joined the General Electric Schenectady Works in 1899, working in the factory. A few years



Sturd-E all steel welded Take-up Reel

Exclusive in
VALUE— UTILITY *and* LIFETIME SERVICE

Sturd-E Reels are exclusive in all welded steel construction. Result—in service life, value, and ease of use, they are unmatched.

The Sturd-E Take-Up Reel is collapsible for ease in transporting. All steel construction —electric welded throughout —adds value that is unequalled.

The Sturd-E Pay-Out Reel is quickly adjustable to accommodate any of the various sized bales of wire. All welded steel construction assures lifetime value. Quickly attached to back end of trucks.

Specify Sturd-E Reels for all service—to obtain the tops in value and utility.

STURD E TOOLS
a TRUE TEMPER PRODUCT

Sturd-E all steel welded Pay-out Reel

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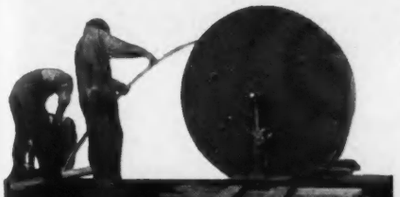
JOSLYN MFG. & SUPPLY COMPANY
Executive Offices
20 North Wacker Drive • Chicago, Illinois
Branches and Warehouses with Complete Stocks in Principal Cities of the United States



Makeshifts Cost More than Simplex Cable Reel Jacks

No danger from falling or "runaway" reels when they are raised on Simplex Reel Jacks for fast, easy pay-out or take-up of cable. Less stress on cable sheathing. Reels last longer. 13 models for all size reels. Model 320-A shown. Screw Type for economy; Lever Type for speed. They're all in Bulletin U-42.

Templeton, Kenly & Co.
Chicago, Ill.
Better, Safer Jacks Since 1899

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

ALL the strength and durability inherent in steel are combined---with definite economies---in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

later he was assigned to the company's outside installation force, now known as the contract service department. In the last decade Mr. Spiegel has traveled to Norway to supervise work on a rotary converter at a zinc processing plant, and twice to South America to install generators.

▶ C. L. PROCTOR, president and general manager Toledo Edison Co., was recently named salvage co-ordinator for Toledo, Ohio, at a meeting of WPB representatives with the local Chamber of Commerce.

▶ OSCAR P. CLEAVER, for twelve years a lighting engineer with the lamp division of the Westinghouse Electric & Manufacturing Co., has been commissioned a captain in the U. S. Army Engineers Corps. Mr. Cleaver is the newly elected general secretary of the Illuminating Engineering Society and has served as chairman of the Chicago and New York sections and as regional vice-president of the New England area. He is a member of the American Institute of Electrical Engineers and of the New York Electrical Association. Mr. Cleaver participated actively in plans for the lighting effects at the recent Chicago and New York World Fairs and represented Westinghouse at the International Illumination Congress in Great Britain in 1931.

▶ E. E. TUGBY, sales engineer of the Pacific Electric Manufacturing Co., San Francisco, has resigned to take the position of electrical engineer in the South Pacific division office of the U. S. Engineers Corps. Prior to joining Pacific Electric Mr. Tugby was for many years in the operating department of the Puget Sound Power & Light Co. at Olympia, Wash.

▶ ROBERT H. MORSE, JR., who has been branch manager successively of Fairbanks, Morse & Co.'s Cincinnati, Dallas and Boston offices, has been appointed assistant sales manager of the company, reporting to A. C. Dodge, vice-president and sales manager. JOHN ELMBURG, former manager of the company's diesel engine department at St. Paul, Minn., has been made manager of the Boston branch to fill the vacancy left by Mr. Morse.

▶ JOSEPH E. MOODY has been appointed manager of industrial relations for the York Ice Machinery Corp., York, Pa. This will mean the establishment of a new division in the administration of the York Ice Machinery Corp. Mr. Moody's duties will embrace all phases of industrial and personnel relations. The industrial relations department will be located at the West York plant but will cover all divisions of the corporation. Mr. Moody brings

Here's a fine
OPPORTUNITY
for an
ENGINEER
to get into
TECHNICAL
ADVERTISING
and
PUBLISHING

Here's the kind of a man we're looking for. We don't expect to find all the qualifications rolled up in one individual —but the more you have the better.

He has a technical background. It will be fine if he is an electrical engineer—or civil, or mechanical. If he hasn't a fancy degree but does possess a practical knowledge of electricity and its applications, that's O.K. too. We'd be delighted if he has worked for a utility and/or an electrical contractor.

He likes to write. It's not painful for him to sit at a desk and pour out words describing installations he has seen—what engineers say about the products they use, and the kind of information they need to help them do their jobs better. He expresses himself clearly on paper and enjoys doing it.

He has written advertising, sales promotion or publicity for a manufacture, or publication—maybe not a lot, but enough to get the taste of printers' ink and to like the flavor.

He knows something about research methods and statistical analysis . . . can work up a pretty acceptable questionnaire and handle the procedure of mailing, tabulating returns and interpreting.

He's 25-35 . . . has a natural curiosity that will make him learn rapidly and grow in his job. He's a nice guy to have around and gets along well with his fellow workers.

The job is in the Sales Promotion and Market Research Department of two of McGraw-Hill's leading publications. If you're interested in the job and possess enough of the above qualifications to put you in the running, let's hear from you promptly please.

Market Research Dept.
Electrical World
A McGraw-Hill Publication
330 West 42nd St. New York

FREE IDEAS

on how to

SAVE HOURS OF WORK WITH BETTER TOOLS

ASK FOR THIS LITERATURE SHOWING HOW GREENLEE TOOLS CAN SPEED UP YOUR CONSTRUCTION JOBS

Get the facts about the complete line of Greenlee Benders and attachments for tubing, conduit, pipe, and bus-bar ranging from ¼ to 4½ inches, in the Greenlee Bender Booklet, S-116.

BENDERS

This Greenlee Folder S-114 describes the handy Greenlee Knockout Tools for enlarging knockouts and holes in metal without long tedious drilling, reaming, or filing.

KNOCKOUT TOOLS

The Greenlee Cable Puller Folder S-115 shows how this handy tool, which clamps right on to the conduit through which the cable is pulled, can make the tough job of cable pulling easy for the electrician.

CABLE PULLERS

Here's the Greenlee Folder S-113 which describes a few of the popular fast and smooth-boring bits from the complete line of Greenlee Boring Tools.

BORING TOOLS

For the contractor interested in learning how to lower underground pipe installation costs, this Greenlee Folder S-117 describes the powerful Greenlee Hydraulic Pipe Pushers.

PIPE PUSHERS

MAIL COUPON TODAY

Please send: ☐ S-116 Bender Booklet ☐ S-114 Knockout Tool Folder ☐ S-115 Cable Puller Folder ☐ S-113 Boring Tool Folder ☐ S-117 Pusher Folder.

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Address_____

City_____ State_____

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GREENLEE TOOL CO.

1809 Columbia Ave., Rockford, Illinois

to his new position wide experience in industrial and personnel matters. Since the beginning of the year he has been district representative of the WPB and now of the War Man-Power Commission. His work with this agency will now be limited to special advisory duties. Before becoming identified with York he was plant manager for the Hat Corporation of America, South Norwalk, Conn. Mr. Moody is a member of the advisory committee on industrial relations and the speakers' committee of the National Association of Manufacturers.

• JOHN S. MORGAN, former manager of Albany, N. Y., district, Frigidaire Division, General Motors Co., has been appointed manager of the New England district with headquarters at Boston. He assumes the duties formerly handled by JOHN S. PFEIL, recently commissioned a major in the U. S. Army. Mr. Morgan entered the company's service in 1926 as financial sales representative for its Acceptance Corporation, joining the Frigidaire division in 1931. In 1935, after serving as sales manager for the Cleveland Frigidaire district, he became public utility representative, after which he was zone manager of household sales and assistant appliance sales manager. He was appointed manager at Albany in 1940.

OBITUARY

John C. Martin

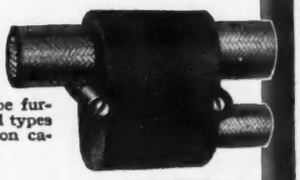
John C. Martin, for many years engaged in the operation and management of public utility properties in various parts of the country and for several years Western editor of ELECTRICAL WORLD, died on August 18 in Los Angeles, Calif., after a long illness. In many ways Mr. Martin contributed the results of his broad experience to the electrical industry.

He entered the utility field in 1903, when he joined the Cedar Rapids & Iowa City Railway & Light Co. After serving that company for eight years in nearly every department he became identified with the Pacific Power & Light Co., Portland, Ore., as engineer, subsequently being made assistant to the chief engineer and then chief engineer. In 1917 the Electric Bond & Share Co., which controlled Pacific Power, sent him to Allentown, Pa., to take charge of engineering work for all its properties in that state. Mr. Martin engaged in consolidation and construction work with these companies for 2½ years previous to assuming his editorial duties for ELECTRICAL WORLD in Chicago in 1920. In 1923 he joined the staff of the Middle West Utilities Co. in

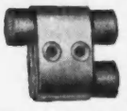
from the **MOST COMPLETE line of Cable Taps**

Now you can select from a really *complete* line of standard and special taps. Every one carefully designed and manufactured.

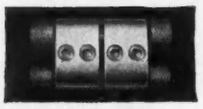
Parallel and 90° taps — and combinations — in the widest variety. For conductor sizes up to 1,000,000 CM.



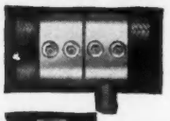
Gutter Tap with Bakelite Cover. Insulating covers can be furnished for all types of Penn-Union cable taps.



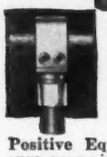
2-way Gutter Tap. Main and branch sizes 8 to 1,000,000.



Two Separate Parallel Taps to a continuous main conductor.



Combination Cable Taps; one branch parallel to main, and one at 90°.



Hinged Clamp of Penn-Union Type HFM makes installation easy. Multi-slit tapered sleeve assures permanent grip on branch.

Positive Equalized Pressure on main and branch, with Penn-Union Type SM. Tightening torque is accurate measure of the clamping force.

Also the *most complete line* of Service Connectors — Terminals — and thousands of other fittings, for all requirements. *Write for Catalog*

PENN-UNION ELECTRIC CORPORATION

ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION

Conductor Fittings

the Chicago office, and subsequently became editor of the *Safety Bulletin*, published by the Bureau of Safety, Chicago.

While in Oregon Mr. Martin did outstanding work for the Northwest Electric Light and Power Association as chairman of the technical and hydroelectric committees. Later he engaged actively in committee work for the old National Electric Light Association and for the American Institute of Electrical Engineers. He was always interested in accident and fire prevention and from the early days was an ardent supporter of the prone-pressure method of resuscitation. He devoted much time and effort to the development of the National Electrical Safety Code.

•

▶ HUGO D. SHARP, 57, New England manager since 1921 of the electrical, wire rope and construction materials department of the American Steel & Wire Co., Boston, died suddenly at Sutton, Mass., on August 22. He was born in Sweden and entered the company's employ at Worcester, Mass., in 1900, joining its sales forces about eight years later. He was widely known in electrical and construction fields in the northeast and was extremely active in the industrial phases of the war effort.

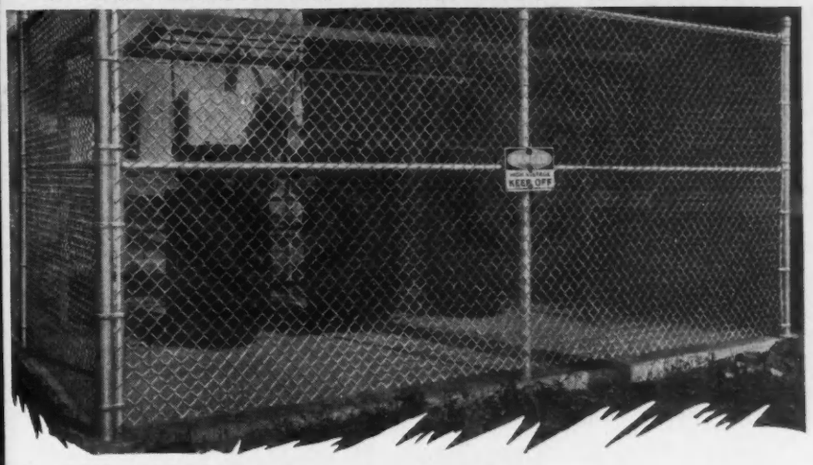
▶ CHARLES R. MAIN, 57, former treasurer and lately a director of Chas. T. Main, Inc., Boston, consulting engineers, died at Winchester, Mass., on August 22. He was born at Lawrence, Mass., and was educated at Thayer School of Engineering and the Massachusetts Institute of Technology. Last spring he was elected president of the Boston Society of Civil Engineers, and at the time of his death he was an overseer of the Thayer school. Most of his career was devoted to work in the organization founded by his father, Charles T. Main, who is now chairman of its board.

▶ VICTOR F. VON LOSSBERG, designer of industrial devices and president from 1914 to 1938 of Edward F. Caldwell & Co., electrical fixtures manufacturer, died of a heart ailment, on August 26 at his home in New York. He was 79 years old. Born in Russia, he came to the United States as a young man and entered the lighting fixture industry. In 1895 he formed a partnership with the late Edward F. Caldwell.

▶ WALTER L. MACFARLANE, manager for the past 22 years of the Stormont Electric Light & Power Co., Ltd., and Cornwall Street Railway, Light & Power Co., Ltd., died at Cornwall, Ont., on August 22, in his seventy-first year.

PAGE FENCE

America's First Wire Fence — Since 1883



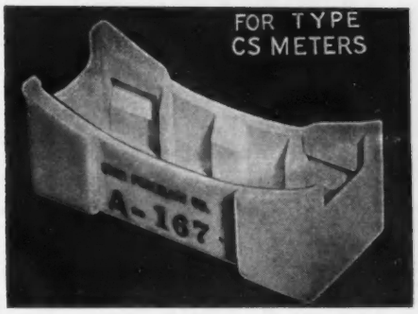
BULWARK AGAINST TAMPERING WITH POWER FACILITIES

● To make America safe, its power facilities must be protected against all with malicious intent. On its service and quality records, Page Industrial Fence is recommended for trustworthy duty at property boundary lines. • Woven wire fence was originated by J. Wallace Page in 1883, and the company which he founded has pioneered in every major development for almost sixty years. • Page Fence distribution is unique and extensive. This service is performed by more than 100 local, responsible firms having technical training and fence erecting experience. These fence experts comprise the PAGE FENCE ASSOCIATION, Headquarters: Monessen, Penn.

VICTORY FIRST
At the Page mills, men, machines and materials are on an all-out schedule for production of fence to protect plants working on Government orders

PRODUCT OF PAGE STEEL & WIRE DIVISION—AMERICAN CHAIN & CABLE COMPANY, INC., BRIDGEPORT, CONN.

Sold Direct to Power Companies



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STAR METER SEAL

It eliminates meter tampering and theft of current. Cannot be removed without destroying or mutilating.

Send for sample

STAR PORCELAIN COMPANY

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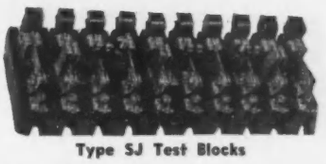
NOW more than ever TEST BLOCKS for Meter and Relay Installations with potential and current transformers are NEEDED to protect personnel and property.



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Wide selection of pole arrangements
Many distinctive features
Full details given in Cat. #1, Sec. 9.

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To The STATES Company
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Hartford, Conn.
Please send full information on STATES Test Blocks

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Insure Smooth, Close Control...

● In actual performance, Ohmite Rheostats have been operated over a million times without servicing of any kind. It's the design, the construction, that makes them so dependable for electrical control of test instruments or power switchboards, meters or motors, operating equipment or laboratory apparatus. Permanently smooth, close control is built-in. Ten sizes from 25 to 1000 watts, in stock and special units to meet every need. Units produced to Government specifications or engineered for you.

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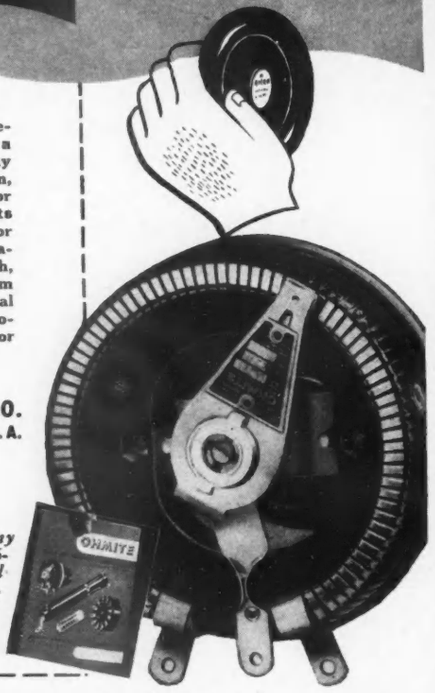
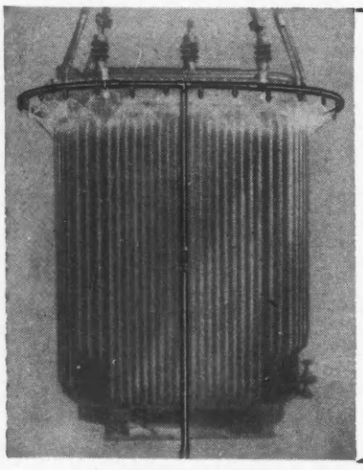
BE RIGHT WITH ★ OHMITE Rheostats Resistors Tap Switches

Write on company letterhead for 96-page Industrial Catalog and Engineering Manual No. 40.





WHY WORRY ABOUT POWER TRANSFORMER OVERLOADS!

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USE

BROOKS SPRAY RINGS

Write for Details and Engineering Test Reports

JOHN A. BROOKS SPRINKLING SYSTEMS
20122 Livernois Ave. Detroit, Mich.
Patented Sprinkling Devices Since 1915

HIGH GRADE HARD PORCELAIN
FOR
Electrical Specialties
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IMPERIAL PORCELAIN WORKS
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G.C.A.
Lamp Replacers
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Switch Hooks

Send for Catalogue

We have been making safety tools for 26 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

Mr. Macfarlane pioneered in the electric light and power field, having joined the staff of the Royal Electric Co., one of the predecessors of Montreal Light, Heat & Power Consolidated, more than fifty years ago. Shortly after the turn of the century he became associated with the Messrs. M. P. and J. T. Davis, contractors on the St. Lawrence River canals and proprietors of the St. Lawrence Power Co., Ltd., now a part of the Niagara Hudson system. Following demobilization after the first World War he became manager of the two Cornwall utility companies in 1920.

▶ MARSHALL A. SNOW, 48, an electrical engineer who had been employed by the Boston Edison Co. for about 20 years, died at Middleboro, Mass., on August 12.

▶ ISRAEL O. BLAKE, 89, founder of the Cornell Electric Manufacturing Co., which was later merged with the Dubilier Condenser Co., Plainfield, N. J., died recently at North Hartley, Que. He was a director of the Cornell-Dubilier company and resided in New York City.

▶ JOHN E. BROWN, formerly general manager of the Ottawa Hydro Electric Commission, died at his home in Ottawa on August 23. He was 73 years of age. Builder of the old Standard Electric Co. plant in Ottawa in 1890, Mr. Brown also founded in 1901 the old Consumers Electric Co., predecessor of the commission. He retired from the Ottawa commission in 1937.

▶ JOHN S. CONOVER, retired assistant to the vice-president of the General Electric Co. and a pioneer in electric power development abroad, died on August 23, in his seventy-ninth year. After joining Thomson-Houston International Electric Co., Mr. Conover went to Germany in 1890 and while employed in that company's German division he installed Germany's first trolley line in Bremen. Returning to the United States in 1894, he was named assistant superintendent of construction for General Electric, and a few months later was promoted to superintendent of construction. In 1898 he was appointed engineer of the foreign department of General Electric, and while serving in that capacity planned the Cauvery Falls transmission development in India, one of the first major electrical developments in that country. Four years later he went to England to join British Thomson Co., returning to this country in 1907. He went to Schenectady and shortly after was made assistant to Francis C. Pratt, vice-president. Mr. Conover retired in 1931.

MANUFACTURING-MARKETS

Westinghouse Profit Down, Taxes Up

For the twelve months to June 30 Westinghouse Electric & Manufacturing Co. and its subsidiaries have reported a net profit of $18,280,821 after deducting $72,571,784 for federal income and excess profits taxes. Under the participating provision of the shares, this is equivalent to $5.70 a share on the combined 79,974 shares of 7 percent preferred stock and 3,126,581 shares of common stock.

Net income for the twelve months to June 30, 1941, was $20,716,817, or $7.75 a share on the combined 79,974 preferred and 2,592,155 common shares after taxes of $28,123,850.

•

Holtzer-Cabot Electric Raises Wages 10 Percent

New rates of pay for employees of the Holtzer-Cabot Electric Co. which increase pay rates of all workers in the plant by at least 10 percent, and give proportionately larger increases to workers in lower brackets, have been announced by A. R. Welton, president. Increases became effective August 31.

Announcement of the purchase of Holtzer-Cabot by Commercial Investment Trust Corp. was made last week.

•

New Standards Issued by Welding Society

American Welding Society has recently approved and published an emergency standard on spot welding of aluminum alloys in aircraft, entitled "Tentative Standards and Recommended Practices and Procedures for Spot Welding Aluminum Alloys." This report is the result of nine months of concentrated work by a technical committee and represents tentative recommendations for standards of weld quality and performance as well as general recommendations of the best practices and procedures to be followed in spot welding of aluminum alloys in the aircraft industry.

The society has also recently approved and published a new tentative standard, entitled "Code of Minimum Requirements for Instruction of Welding Operators, Part A—Arc Welding of Steel 3/16 to ¾ In. Thick." This code represents a revision of the "proposed code" that was issued by the society in 1941.

•

Reduces Lamp Prices

Sylvania Electric Products, Inc., has announced price reductions on incandescent and fluorescent lamps. The 40-, 50- and 60-watt incandescents now retailed at 13 cents have been reduced to 10 cents. The entire line of fluorescent lamps has been reduced by an average of 15 percent.

•

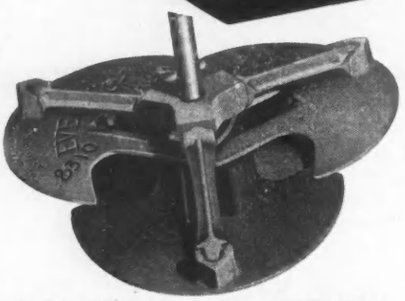
Testing Procedure Assigned to CESA

By mutual agreement between the National Research Council and the Canadian Engineering Standards Association, the listing of equipment and materials found, after examination and testing, to comply with the requirements of appropriate specifications respecting fire hazard, will be undertaken by the Canadian Engineering Standards Association, instead of by the National Research Council as heretofore. The change became effective September 1.

Such equipment and materials will

STUDY MILLION-DOLLAR TRANSACTION—Arthur O. Dietz (left), president Commercial Investment Trust Corp., and A. R. Welton, president Holtzer-Cabot Electric Co. of Boston, study final draft of announcement that Holtzer-Cabot had been purchased by C.I.T. Under the transaction, involving more than a million dollars, Holtzer-Cabot became the first manufacturing C.I.T. subsidiary.

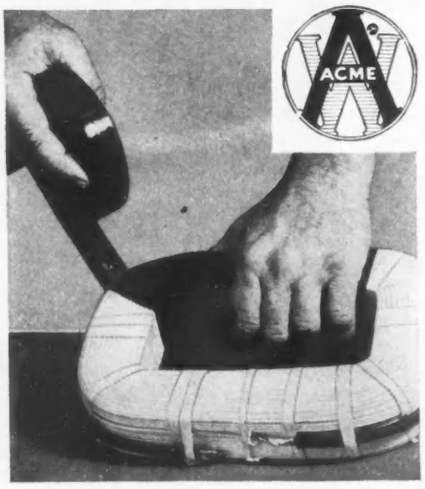
First CHOICE IN ANCHORS



EVERSTICK

For dependable anchoring under all conditions, use Eversticks. Made of tough, rust-resistant, malleable iron . . . quick and easy to install . . . expand in undisturbed earth. Preferred by engineers and crews alike. Write for latest Everstick bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA



Bias Tapes with

PLENTY OF STRETCH

THEY fit snugly into all corners and crevices. Their exceptional flexibility and tensile strength are due to an Acme developed process of applying pure vegetable oil varnishes of Acme formula to highest grade cotton fabrics. Offered in bias or straight tapes, and in rolls up to 36" wide —yellow or black. Samples if requested.

The Acme Wire Co., New Haven, Conn.

Acme Wire Products

VARNISHED INSULATIONS — MAGNET WIRE COILS.

be tested in laboratories named by the Canadian Engineering Standards Association, under a procedure similar to that now followed by the National Research Council. As of September 1, all listings granted by the National Research Council will be canceled. Equipment and materials previously listed by the Council will be granted temporary listing by the Canadian Engineering Standards Association, on application, on a basis of the former National Research Council listing.

•

Belden Holders Take War Bonds Dividend

Stockholders of the Belden Manufacturing Co. subscribed for a total of 10.6 percent of the dividend paid on September 1 in either war savings bonds or stamps, Whipple Jacobs, president, has announced. The company is believed to be the first with listed securities to make war bonds and stamps available in the form of dividends.

The company received this week, in a special ceremony, a double award from the Treasury Department for its efforts in furthering the sale of war savings bonds and stamps. The first award was a Minute Man flag, presented because at least 90 percent of the company's employees are subscribing to war bonds and stamps under the payroll allotment plan. The second award is a special citation praising the company's innovation of the war bond or cash dividend plan.

•

Manufacturers Make Sales Assignments

Among the sales appointments recently announced by electrical manufacturing companies are the following:

Roller-Smith Co., Bethlehem, Pa., has appointed William N. Grooms, Salt Lake City, Utah, as a district sales agent. Mr. Grooms will handle all Roller-Smith products in the states of Utah, Idaho, Montana and the southwest corner of Wyoming. He will maintain offices at 630 Dooly Block, Salt Lake City.

Square D Co., Detroit, has announced that W. W. Hendrickson has been transferred from the Charlotte office to open a new office in Greensboro, N. C., located at 303 Kensington Road.

•

Buys Phelps Dodge Unit

Thermador Electrical Manufacturing Co. of Los Angeles has announced its purchase of the machinery, dies, equipment and inventory of the Inca Manufacturing Division at Los Angeles of the Phelps Dodge Copper Products Corp.

Natvar

FLEXIBLE INSULATION

● Here are quality Natvar insulations for the electrical industry:

Varnished and synthetic coated cambric, (yellow and black, straight-cut and bias.)

Varnished and synthetic coated cable cloth.

Varnished and synthetic coated canvas, duck, and papers.

Varnished, lacquered and synthetic coated tubings and sleevings.

Extruded Vinylite tubings, shapes and rods.

Flexible optical tubings.

These products are supplied in all normal commercial sizes, thicknesses, and colors, and in accordance with standard and special specifications.

We will be pleased to submit samples, prices and any additional information required.

Write for these free circulars

- Natvar Tubing and Sleeving
- Natvar Varnished Cambric
- Natvar Extruded Vinylite Tubing V.I.T. #200

THE NATIONAL VARNISHED PRODUCTS CORP.
211 Randolph Avenue, Woodbridge, New Jersey

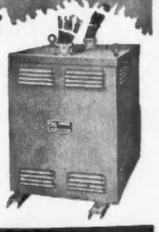
AIR COOLED TRANSFORMERS
50 KVA UP TO
2400 VOLTS

Acme Air Cooled Transformers now available in following ratings.

3 to 50 KVA, 60 cycle, 3 phase 240/480; 600; 2400 volt primary.

1½ to 50 KVA, 60 cycle, single phase 240/480; 600; 2400/4160 volt primary.

Write for Acme Air-Cooled transformer Bulletin.



THE ACME ELECTRIC & MFG. CO.
43 Water St. Cuba, N. Y.

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Active electrical men say it's the most valuable volume in their offices. Use it yourself . . . it's *your first source of information.*

• ELECTRICAL • BUYERS REFERENCE

330 West 42nd Street, N. Y. City

Field Reports on Business

Reports from various sections of the country indicate the existence of a tremendous need for a wide variety of electrical equipment. Wire and cable, motors, transformers, welding apparatus and lighting equipment orders run into large volume. Retail sales continue to decline.

PACIFIC COAST

Major electric appliance sales on Pacific Gas & Electric lines in northern and central California for first half of 1942 as compared with first half of 1941 showed decreases of 13 percent on cleaners, 16 percent on ironers and water heaters, 35 percent on ranges and 60 percent on refrigerators, whereas radios, washers and sewing machines ran even for both years. These electrical figures contrast with overall department store increased sales of 16 percent in the same typical area, and 50 percent increased farm income, in the same period.

Coast manufacturers of lighting fixtures and reflectors are utilizing plastic and masonite as replacements for critical aluminum and steel.

Orders cover $20,000 lightning arresters, $25,000 G.E. hoist, derrick and crane motors and controls, 1,000 1/50th h.p. motors for calculating machines, $20,000 fractional horsepower motors for pressure pump systems, 150 welding sets costing $70,000 for shipbuilding firm, and 500,000 Flaminol cable for naval air depot.

NEW ENGLAND

Tenders for large quantities of wiring supplies for light and power have been submitted to various government departments recently and include electric cable, about 100,000 ft. copper telephone wire, two lots totaling 500 knife switches, inclosed fuses and fuse links, 108 electric portable heaters, flashlights and dry batteries. Twenty-five portable electric ventilating blowers costing about $5,000 were bought a short time ago from a Massachusetts manufacturer; orders for capacitors, small electric tools, busbar copper and insulating materials are in good volume. Small motor sales are steady.

Central Vermont Public Service has been authorized to construct a 960-ft. special 44-kv. river transmission span with wood pole terminal and intermediate structures. Burlington, Vt., airport has installed contact lighting costing $21,000. Seven hundred Smithcraft fluorescent lighting units have been ordered for the Vought-Sikorsky engineering building, Bridgeport, Conn. About 1,500 fluorescent units will be installed in the former Mitchell plant taken over by Sikorsky. New Haven Clock Co. is installing a new wiring system, and Weymouth, Mass., has been granted priorities as a strategic area to purchase thirteen new air-raid sirens at a cost of $2,800. Champion Lamps Works, Inc., Lynn, Mass., has modernized its internal distribution system with an installation of three-phase, four-wire Bull Dog low reactance "BUStribution" duct of 1,000 and 1,500 amp. ratings.

A federal housing project at Bridgeport, Conn., has purchased 600 Colt multi-breakers for distribution circuit protection and 150 4-meter Colt meter socket troughs. Thirty-one buildings are to be equipped with a Colt multi-breaker with extra switch for street lighting control. Manufacturers in this area have tendered bids for 500 outlet boxes and 5,000 covers with box connectors and accessories for other federal housing projects.

Massachusetts reached its highest industrial output level during July. Sylvania Electric Products, Inc., has announced substantial reductions in incandescent and fluorescent lamp prices effective September 1. Radio apparatus manufacturers report plant facilities employed to full capacity for fulfilling orders for government departments.

NEW YORK

Department store sales declined 3 percent in the week ended August 22, compared with the corresponding week a year ago, according to the Federal Reserve Board. For the latest four-week period sales were off 3 percent also. For the seven-month period of this year, however, sales are up 13 percent over 1941's period.

Engineering construction volume for the week amounted to $217,798,000, which topped the total for the corresponding 1941 week by 75 percent, but was 6 percent lower than the volume reported for the preceding week, according to *Engineering News-Record*. The current week's construction brings the 1942 total volume to $6,919,897,000, an increase of 60 percent over the total for the 35 weeks of 1941. Private work for the period is off 51 percent, but public construction is up 89 percent, compared with a year ago, due to the 138 percent increase in federal work.

CHICAGO

Picking up momentum steadily during the past six months, war business has brought this area into the boom class. Persistent layoffs in civilian goods industries exceeded hirings in war plants for the first six months of the year. However, in July the downward trend was arrested and war employment now exceeds civilian losses by a substantial margin. The number of people now employed in this area has undoubtedly reached an all-time high.

The demand for industrial electrical equipment continues at peak levels. The construction of many huge war plants and expansion of existing factories has created a tremendous need for a wide variety of electrical apparatus for industrial uses. Wire and cable, motors and control, transformers, welding apparatus, lighting equipment, bus-duct and maintenance items are all booked months ahead. In addition, orders for equipment for direct war uses run into large volume.

Retail trade continues to decline as department store sales last week decreased 3 percent from the previous week and 12 percent from a year ago. Independent retailers in Illinois reported a 3 percent drop in sales during July from the same month last year. Most non-durable goods lines enjoyed substantial increases for the month but the sales of durable goods fell way below a year ago. Electrical appliance shortages continue to grow as the demand keeps fairly high.

A housing development containing 248 residences is being built in this city at a cost of $1,488,000 and carrying an A-1-C rating. A war housing project of 596 units with an A-1-J rating will get under way in Seneca, Ill. Commonwealth Edison Co. is taking bids for boiler house alterations at the Calumet generating station.

MATTHEWS SERIESWITCH

It Is a Fallacy to Take Chances

that some little boy or girl will not pick up or attempt to play with a live wire on the ground caused by an open circuit on a series circuit street lighting loop. Just because such an accident has not yet happened on any of your circuits, there can be no guarantee that it may not happen tonight, if your circuits are not adequately protected.

The reason for the development of Matthews Serieswitch is because a child was killed and a man injured within a few weeks of each other and some of those who had series street lighting circuits wanted an efficient and inexpensive device which would instantly cut out an open circuit, without affecting any of the rest of the main circuit or other loops off the main circuit.

It will pay you to look into the possibilities of Matthews Serieswitch, if you are operating series circuits, whether or not you have had any series lighting open circuit accidents. Send for Bulletin 532-B which gives complete information.

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READERS MAY CONTACT THE CONSULTANTS

whose cards appear on this page with the confidence justified by the offering of these special services nationally.

Sales Opportunities

CONNECTICUT—Hartford Electric Light Co., Hartford, has approved plans for new outdoor-type power substation for distribution feeder service, with installation to include voltage regulators and accessories. Work is scheduled to begin at once.

LOUISIANA—Aviation Department, New Orleans, Douglas O. Langstaff, director, plans airport lighting system in connection with development of airfield, including contact lighting units, range lights, obstruction lights, marker lights, switching station and control house, underground conduit system, transformers and accessories. Entire project will cost about $1,390,000. Financing secured through federal aid.

CALIFORNIA—War Department, Washington, D. C., has authorized air force base. Complete electrical equipment and facilities will be installed for airfield, industrial and residential service. A power substation is planned. Entire project will cost over $4,000,000 and will be supervised by U. S. District Engineer Office, Los Angeles.

KENTUCKY—Mengel Co., Inc., 1122 Dumesnil Street, Louisville, manufacturer of wood packing cases and other containers, plans new plant in Kentucky for production of aircraft parts for government, comprising main three-story structure, about 253x700 ft., and auxiliary buildings, with complete electrical equipment and facilities. A power substation is planned. Entire project is reported to cost close to $1,000,000, with financing through Defense Plant Corporation. Work will begin soon.

MINNESOTA—Light and Power Department, Alexandria, has plans under way for addition to municipal power plant, with installation of equipment for increased capacity. Estimates of cost are being made. Ralph D. Thomas & Associates, 1200 Second Avenue South, Minneapolis, are consulting engineers. Board of Public Works is in charge.

NEW MEXICO—New Mexico Power Co., Santa Fe, has authorized construction of new power dam for increased service at hydroelectric generating station. Cost about $300,000. Sanderson & Porter, (52 William Street, New York, N. Y., and 123 Water Street, Santa Fe, for project office), are consulting engineers.

MISSISSIPPI—War Department, Washington, D. C., has authorized new air force base at army camp, including group of one-story buildings, with shop and industrial structures. Complete electrical equipment and distribution facilities will be installed, with power substation units. Entire development will cost in excess of $3,000,000, and will be supervised by U. S. District Engineer Office, Vicksburg.

WASHINGTON—Portland General Electric Co., Portland, Ore., has plans maturing for new power substation at Vancouver, where clearing of site is now under way. It will be equipped for large capacity, increasing power facilities of company in that area by about one-third. Also will make extensions in transmission lines for service of new station.

TENNESSEE—Chattanooga Stamping & Enameling Co., Inc., Chattanooga, manufacturer of enameled iron products, plans addition to plant, comprising main one-story unit, about 120x800 ft., and auxiliary structures, with complete electrical equipment and facilities. Cost reported close to $500,000. Work will begin soon. James Verhey, 3813 Monte Vista Drive, Chattanooga, is in charge of construction. R. H. Hunt Co., Chattanooga Bank Building, Chattanooga, is architect.

KANSAS—War Department, Washington, D. C., has authorized new air force base, comprising group of one and multi-story buildings, with hangars, shops and industrial structures. Complete electrical equipment and distribution facilities will be installed. A power substation is planned, with boiler plant for central-heating and other service. Entire project will cost over $3,000,000 and will be supervised by U. S. District Engineer Office, Albuquerque, N. M.

FLORIDA — Municipal Electric Department, Jacksonville, plans early call for bids for 25-mile transmission tie-line with Florida Power & Light Co. Entire project is estimated to cost $475,000, including switching station and other facilities. Financing through federal aid.

ARIZONA—Elizalde & Co., Ltd., 405 Montgomery Street, San Francisco, Calif., plan new cement mill in vicinity of Tucson, comprising several large one and multi-story production buildings and auxiliary service structures, with complete electrical equipment and facilities. A power plant is planned. Entire project is estimated to cost close to $1,200,000. Application has been made for priority rating for plant. W. C. Stevenson is company engineer.

COLORADO—Bureau of Reclamation, Denver, receives bids until September 21 for four 50x50-ft. regulating gates for installation in spillway at Keswick Dam, Kennett Division, Central Valley project, Calif. Equipment will be installed by government (Specifications 1045).

WASHINGTON—Puget Sound Power & Light Co., Seattle, has contracted with Bureau of Yards and Docks, Navy Department, Washington, D. C., for construction of transmission line on new poles for a federal depot. Work is scheduled to be carried out at once.

TEXAS—U. S. District Engineer Office, Denison, has plans maturing for an overhead electrical distribution system for a government development in Texas. Bids will be asked at early date.

MICHIGAN—War Department, Washington, D. C., has approved plans for new air force base, including large group of buildings, with hangars, shops and other industrial structures. Complete electrical equipment and distribution facilities will be installed. A power substation and boiler plant are planned. Entire development will cost over $3,000,000 and will be supervised by U. S. District Engineer Office, Detroit.

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Plan Two New Lines

City Council of Grand Coulee, Wash., has granted to the U. S. Government a franchise for the immediate construction of two additional high-tension electrical lines to be carried by steel towers across the city's distribution system near the west city limits.

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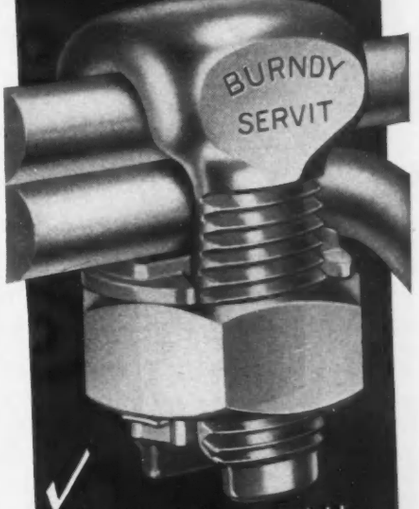

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BOOKS RECEIVED

Procedure Handbook of Arc Welding Design and Practice. Published by Lincoln Electric Co., Cleveland, Ohio, 1,267 pages, illustrated. Price, $1.50 in U. S. A., $2 elsewhere.

This 7th edition contains matter on the following topics not treated in the 6th edition (1940); symbols, stress relief, preheating, flame cutting, cost estimating, "fleet-fillet" technique, metallurgy of alloys, weldability of aluminum alloys, list of cities sanctioning structural welding.

Fluorescent Lighting Manual—By Charles L. Amick. McGraw-Hill Book Co., New York. 312 pages, illustrated. Price $3.

First tells simply how the fluorescent lamp and its accessories function, how to install it, maintain it, correct troubles, and then how to design an installation and select the luminaires to accomplish a desired improvement in quality and intensity of lighting. What lighting practitioners undoubtedly have been hoping would appear under one pair of covers. Author is Nela Park authority.

Electric Motors in Industry—By D. R. Shoults and C. J. Rife; editor, T. C. Johnson. John Wiley & Sons, Inc., New York. 389 pages, illustrated. Price $4.

With minimum of mathematics and maximum of homely explanation, this "G. E. Series" book not only treats the application and control of a.c. and d.c. but industrial power supply, distribution, power factor and electronic equipments for lighting, welding, etc.

What the Citizen Should Know About the Army Engineers—By Lieut. Col. Paul W. Thompson. W. W. Norton & Company, New York. 210 pages, illustrated. Price $2.50.

History, functions (civil and wartime), opportunities for professional volunteers. Details Eben-Emael capture and Sedan break-through. Camouflage principles, roads, water, transport, maps, power, improvisation (*e.g.*, Dunkirk bridge of trucks).

Elements of Heat Transfer and Insulation—By Max Jakob and George A. Hawkins. John Wiley & Sons, Inc., New York. 169 pages, illustrated. Price $2.50.

Mechanisms of heat transfer analyzed in compact but simple quantitative terms in effort to translate customary graduate course to advanced undergraduate levels; ample design data and examples for both electrical and mechanical power engineers concerned with heat transferences.

How to Conduct Conferences. By Alferd M. Cooper. Published by McGraw-Hill Book Co., New York, N. Y. 191 pages. Price $1.75.

Prerequisites for the leader, the agenda and the technique for effective conferring whether for teaching, selling or to arrive at competent decisions.

Welding Handbook—1942 Edition. Published by American Welding Society, 33 W. 39th St., New York, N. Y. 1593 pages, illustrated. Price to members, extra copies, $5; price to nonmembers $6 in U.S.A., $6.50 elsewhere.

Three times as many contributors were drawn upon in this extensive revision of the 1938 edition, which is thereby enlarged one-fourth in timely treatment of welding in war work and its incidental accompaniments. Being the product of a professional society, it is quite naturally authentic, comprehensive, impartial and educational in aim and performance. There is much data on welding loads of interest to power supply engineers.

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(Classified Advertising)

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